THE
ELECTRICAL REVIEW

Volume CXXVII. No. 3278

Friday, September 20th, 1940

Contents

	Page
Editorial — Electrical Contracting in Wartime	235
Water Power in Eire	237
Steam Condensers. By V. Walker, A.M.I.E.E.	238
Progress in South Africa	239
Absolute Units. By "Sliderule"	240
Resuscitation from Shock. By G. H. Bell, B.Sc., M.B., and J. A. C. Knox, M.B.	241
Personal and Social	242
Thermo-electric Couples. By L. P. Dudley	243
The Manufacturers' Representative. By J. Whitehead	244
Commercial and Industrial	245
Switchgear Factory Extensions	247
Carbon Steel Arc Furnaces	248
Electricity Supply	248
New Books	249
Financial Section	250
Contract Information	254

Classified Advertisements (Official Notices, Situations Vacant, etc.)	45
Index to Advertisers	68

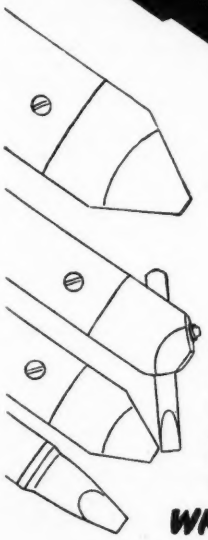
EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1

Telegraphic Address: "Ageekay, Sedist, London." Code, A.B.C. Telephone No.: Waterloo 3333 (35 lines)
Subscription Rates, Postage free: United Kingdom, £1 16s. 10d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum
Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank

A SOLON MODEL
for specialised work

Almost every variety of work is covered by one of the standard Solon Electric Soldering Irons specially designed for industrial use. The illustration shows the 65 watt "pencil" bit, actual size. All Solons for industrial use are subjected to a pressure test of 600 volts to earth for one minute and conform to Home Office requirements. All connections safe from heat and corrosion in the bakelite terminal box. Complete with 6 feet of HENLEY tough rubber-sheathed 3-core flexible. Made for the following standard voltages: 100/110, 200/220, 230/250.

Made in England by
W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., (28/D), Engineering Sales Department, GRAVESEND, KENT.



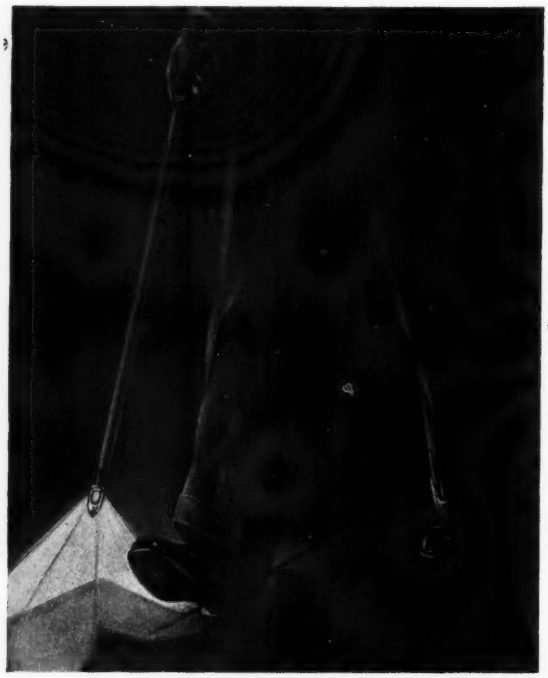
OTHER STANDARD 'SOLON' MODELS

These diagrams show the shapes (much reduced) of other models in the Solon range. There are 240, 125 and 65 watt industrial Solons, also a 65 watt handyman model suitable for domestic use.

WRITE FOR LEAFLETS

SOLON TRADE MARK
Electric
SOLDERING IRON FOR INDUSTRIAL USE

GO TO IT IN SAFETY WITH A BEKKO



The Blackout holds no terror for BEKKO users.

YOUR destination can be reached quite safely and quickly in the blackout with the BEKKO illuminated walking stick.

The BEKKO is supplied in two finishes, Ebony or Walnut, and in designs suitable for men or women.

Berry's ELECTRIC LTD.

(of MAGICOAL FIRE Fame)

TOUCHBUTTON HOUSE, Newman Street, London, W.1

Telephone : Museum 6800 (9 lines)

Also BIRMINGHAM, MANCHESTER and NEWCASTLE-ON-TYNE

CAMBRIDGE *automatic* CONTROLLING PYROMETERS

Installed in a Government factory. This temperature control room is equipped exclusively with 40 Cambridge controllers and 8 Cambridge recording potentiometers, operating a battery of "Birlec" electric furnaces. Each furnace is 35 feet deep, divided into 5 zones. The controllers regulate the temperature of each zone to a pre-arranged time temperature curve, within close limits, and have proved dependable for regular and accurate service.

Write for FOLDER 41M.

FOLDER No. 67-X gives details of our ELECTRICALLY-OPERATED CONTROLLERS.

FOLDER No. 68-X gives details of our MECHANICALLY-OPERATED CONTROLLERS.

FOLDER No. 51-X contains illustrations of many installations of our controllers on various types of furnaces.

MAY WE SEND THESE TO YOU ?

CAMBRIDGE INSTRUMENT CO LTD

WORKS: LONDON & CAMBRIDGE — *Head Office & Showrooms*: 13 GROSVENOR PLACE LONDON. S.W. 1.

THE
ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVII. No. 3278 SEPTEMBER 20, 1940 Price SIXPENCE

Electrical Contracting in Wartime

Position of the Smaller Firms

IT might have been thought that the greatly intensified industrial activity would have compensated the electrical installation industry for the loss of business in other directions; that every skilled electrical contractor would be required for some job or another. We find, however, something of a paradox. The Electrical Trades Union is reporting that employment among its members is good (with the exception of the London area), the demand for men being difficult to meet in some districts where "dilution" has had to be resorted to. At the same time the Electrical Contractors' Association is much concerned at the plight of many of its members who can find no work to do.

The position is attributed to the fact that private work is almost at a standstill; Government Departments are responsible for the bulk of the available installation work and, it is said by some contractors, is confining its contracts to a few large firms who are consequently over-pressed while the smaller contractors are sent empty away.

Centralisation of Contracts

The Committee of the London Branch of the E.C.A. gives three reasons for this: That the larger concerns are able to organise and finance substantial contracts; that the Government desires to "centralise" work; and that the smaller contractors have failed to bring their case to the Government's notice.

The first two reasons have a good deal of substance in them, and the attitude of the Government Departments concerned is understandable. A large-scale contract can be a source of endless trouble and inconvenience if it is doled out to a number of firms. The placers of the contract cannot be blamed if they prefer to put the whole of the business in the hands of one concern which will carry it through without the inordinate amount of supervision and other worries which the splitting-up of the work would entail.

The third reason may be quite a valid one, but the fact remains that it cannot be dissociated from the first two, and no amount of representations to Government Departments will alter the position. So long as the majority of contractors remain as individual small units the reluctance of the Departments to give them work will persist.

This is really a new aspect of an old grievance. The problem has already arisen in the past in another form. The hire-purchase business and the control of domestic installation work fell into the hands of the electricity supply authorities largely because the individual small contractor was entirely unable to provide the finance and after-service involved. We suggested over four years ago (ELEC. REV., July 3rd, 1936) that in this matter there was a case for the closer regional organisation of the contractors which would enable them to take over the whole of the installation work in an area in conjunction with the supply authority and allocate it to members. Such an organisation would also be able to tackle the hire-purchase business, also in co-operation with the supply undertaking.

An "All-in" Pooling Scheme

A solution propounded by the London Branch Committee goes much farther than this. It is no less than the pooling of *all* resources by groups of large and small firms. Such a scheme, it is thought, would permit the exchange of labour and material, so facilitating the completion of jobs; it would also simplify purchasing, reduce costing and supervision charges, and "would open up the bottleneck now caused by a comparatively few large contractors who are far too busy to allow for full efficiency and expedition in the execution of such work."

Only twenty-three of the two hundred members approached were directly in favour of the proposal, and Mr. G. F. A. Norman (vice-president of the E.C.A.) urged at a meeting which considered the report that these should immediately get together to form groups. He warned them, though, that they had to be prepared to find that there was a lack of work. One of the largest installation firms in the country, handling a considerable volume of Government work, was employing only half of its pre-war number of operatives.

Some members thought that the Association should do something for the smaller firms—but even the most powerful association cannot create work for its members. It can only help and advise them in their own efforts to secure a livelihood. The E.C.A. has already used its influence in an endeavour to obtain a wider distribution of orders by giving more firms an opportunity of tendering, although this can be extended beyond reasonable limits; too many tenderers would too often mean considerable delay.

And so the matter seems to remain largely in the air while contractors are left with very little to do. The only real hope appears to be that some of the restrictions and inhibitions will soon be removed so that more work of a normal character may be taken up again.

Working and Warnings

SOMETHING more than mere inconvenience is being caused by the frequent air-raid alarms which we are experiencing nowadays; this, of course, is the enemy's main object. Consequently measures have to be taken to minimise the effects. Although raids are widespread, they affect only a very small part of the "warned" areas at any one time, and it is certainly unnecessary for every activity in those areas to cease for periods ranging from half an hour to perhaps several hours. The system of continuing work while watch is kept by picked men for signs of approaching aircraft is now getting under way, and has already led to a great improvement in the conditions. Risks are involved, but risks have to be taken in times like the present. The methods of operating the system should be discussed between the management and workers of each establishment. It has been officially emphasised that working after an alarm has sounded will not affect workers' rights to compensation for personal injury under the Government scheme or their rights under any known life insurance policy which covers war risks; nor does it affect the employers' position under the Personal Injuries (Emergency Provisions) Act.

Significant Trends

DURING the 2,500 years in which electricity has been known, it may be said to have advanced through three epochs: the electrostatic, the electromagnetic-induction, and the electronic. In his chairman's address to the Electrical Engineering Branch of the Institution of Engineers, Australia, Mr. F. G. Sublet suggests that, in spite of the great developments that have taken place in electro-magnetic applications since the beginning of the century, this period will not be regarded by future generations as a continuation of the epoch of Faraday so much as the beginning of an epoch that is based on electronic physics. He points out that recent advances in operating efficiencies, which have been due mainly to improvements in soft magnetic material, insulation, and thermal design of electrical equipment, are less momentous than those due to electronic devices. Principal items in the last category are mercury-arc rectifiers, circuit-breakers, X-ray tubes, cathode-ray oscillographs, thermionic emission valves, lamps and insulation. This trend is exemplified in the increasing appreciation by the electrical engineer of the value of close collaboration with research workers in physics.

Absolute Units

IN practice the electrical engineer is unlikely to be appreciably affected by the legal standardisation of the M.K.S. system of absolute units which it had been intended should take effect from the beginning of this year. Most of his problems are circuit problems, solutions of which are thought and worked out in the everyday practical units that constitute the groundwork of the M.K.S. (Giorgi) system. Only when electromagnetic or electrostatic phenomena intrude into his problems has the electrical engineer to think twice about his units. Here the M.K.S. system, more particularly in its rationalised form, seems to offer him decided advantages over the classical C.G.S. system. It enables him to work as before, and thus almost automatically in terms of the same everyday practical units. Hitherto he has had to employ abstract units which conveyed little or nothing to him, and which had to be multiplied by a variety of numerical constants in order to give working formulæ expressed in practical units. With the M.K.S. system all he has to remember are the numerical values of two fundamental constants, viz., permittivity and permeability in free space, when they appear in any working formulæ, the majority of which are, in addition, simplified by the use of the M.K.S. system in its rationalised form.

Trade with New Zealand

WE have read with pleasure some sympathetic editorial comments in the *New Zealand Electrical Journal* upon the subject of British electrical exports to the Dominion. Our contemporary praises the efforts which are being made here to expand our overseas trade as a means of paying for essential imports. But, it says, these arrangements need a corresponding reorganisation in New Zealand if anything is to come from them. Instances are mentioned in which British manufacturers have secured the necessary materials and licences for the execution of orders only to find that the products involved have been placed on New Zealand's list of prohibited imports. On the other hand, import quotas have been allotted to classes of equipment for which materials are difficult or impossible to obtain. The *Journal* says that there seems to be a need for co-ordinated effort in New Zealand and some method of collaboration between those who understand the nature and extent of the Dominion's electrical industry with those in England who understand the nature and extent of the services which Great Britain can offer.

"Star-lighting" Doubts

APPREHENSION has been evinced in certain towns regarding the visibility of low-intensity lighting from the air. At Chesterfield, where 12½ miles of roads have been provided with the authorised lighting fittings, the Emergency Committee has decided not to use these as members are not satisfied that the lighting cannot be seen from hostile aircraft. At Stockport the Council recently accepted an amendment rejecting a proposal by the General Purposes Committee to install modified lighting. Alderman Bowler suggested that any kind of lighting would be more dangerous than no lighting at all, and said it was desirable that people should restrict their movements. The majority of people need no persuasion on this score, but if industrial production is to be maintained a great many must necessarily travel during the hours of darkness, and lack of any sort of lighting will lead to the indiscriminate use of torches, which constitutes a real danger. It can be said that the Minister for Home Security is perfectly satisfied that the approved fittings may be safely used, and is encouraging the provision of lighting schemes in the permitted areas.

Constant Currents

LABORATORY conditions sometimes call for a test current that is kept at a constant value within extremely fine limits, even though in the same circuit rapid variations of voltages occur. In a Research Paper published by the U.S. National Bureau of Standards is described a method of meeting this requirement. Two vacuum-tube amplifiers are used as alternating voltage compensators, and an iron-core inductor with air gap as a choke. In the case under discussion the circuit has a resistance of about 20 ohms and a direct current of 1A flows. With frequent variations of potential drop of 0.1V in part of the circuit, the current variations are limited to less than one part in a million. From the particulars given the method in question would appear to be a simple and inexpensive way of obtaining the desired results.

Post Early

AT the best of times it is good policy to write and post letters as soon as possible, although there are some who say that many neglected letters answer themselves in due course. To-day there are very good reasons for promptitude. War conditions have made the tasks of the Post Office and newspaper editors much more difficult, and ordinarily for them life is not too easy. Therefore we appeal to our readers to take their pens and write quickly while the mood is on them, and, having written, dispatch their letters at once.

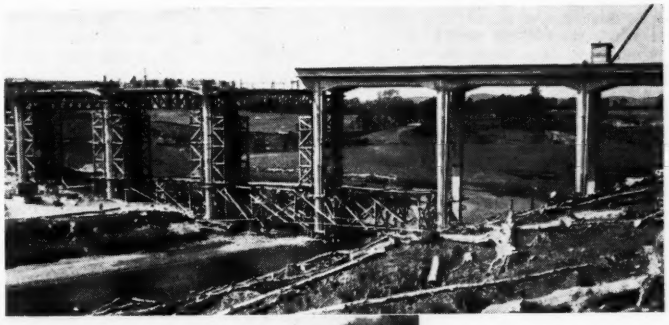
WATER-POWER IN EIRE

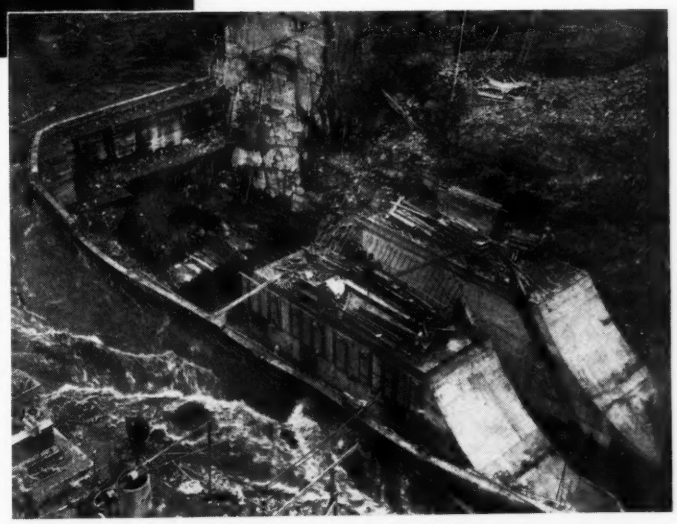
Progress of the Liffey Scheme

THE Liffey hydro-electric works now under construction include a dam about 100 ft. high above the falls at Poulaphouca. The total head available will be about 220 ft., 165 ft. of which will be utilised in a power station about 300 yds. below the present falls and the remainder by a second station situated a mile below them. A tunnel, quarter of a mile in length through the hill, will bring the water from the reservoir to the power station.

The erection of the dam and the intake to the tunnel has been completed to the underside of the superstructure. The gate on the diversion culvert has also been closed and the filling of the lower portion of the main reservoir is in progress.

The dam will raise the water level by 85 ft., causing the water to back up the valleys of the Liffey and the King River, which joins the Liffey three miles above the dam, and flood about 5,600 acres. The maximum discharge, under flood conditions, of the river at Poulaphouca may reach 300 cubic metres per sec. and the minimum may be as low as half a cubic metre per sec. The high water level for storage will be 615 ft. O.D. and the low water level 580 ft.





Views of dam in course of construction and (top) one of the three new bridges

Two 15,000-kW (at mean water level) 250-RPM vertical sets are to be installed at the Poulaphouca station. At Golden Falls there will be one 4,000-kW and one 250-kW sets. The latter will utilise compensation water averaging 1.5 cubic metres per sec., which at all times has to be allowed down the river. The portion of the river—a mile long—between the Poulaphouca and Golden Falls stations will be utilised as a compensation reservoir, which is required to equalise the flow in the lower river, since at full load Poulaphouca station will use about 80 cubic metres per sec., which, if allowed down the river, would cause flooding. The compensation reservoir, having a capacity of 1,000,000 cubic metres, will enable the water required for 3¼ hours running at full load to be retained and distributed over the 24 hours at about 11.5 cubic metres per second, at which rate it will be used by the 4,000-kW set.

The average yearly output of the Liffey scheme will be about 30 million kWh. Dr. Bucki, and Professor Meyer-Peter, in a report to the Electricity Supply Board, estimated the cost of the works at £760,000, which has been provided under the Liffey Reservoir Act. The Liffey stations will be connected to the Supply Board's system by a 110-kV line from Poulaphouca to Inchicore and will run in parallel with the Board's stations at Ardnacrusha and Pigeon House.

During 1939-40 the excavation for the dam at Golden Falls and the tunnel at Poulaphouca was completed, and the construction of the dam and plant is making steady progress. The François Cementation Co., Ltd. (Doncaster), are the civil works contractors. Three bridges, to provide for the variations in the reservoir water level of 35 ft. are being erected. Those at Blessington and Burgage are finished and one at Humphreystown is being completed. The complete generating plant is being provided by the English Electric Co., Ltd.

The excavation of the tunnel, 400 yards in length, between the Poulaphouca station and the reservoir was completed during the year 1939-40. At the power station end of the tunnel the excavation was carried out from above, a channel being blasted out of the rock and then covered over so as to form a tunnel. The remainder (about two-thirds) was drilled and blasted through the hill. Three air compressors feeding pneumatic drilling tools and other appliances were erected on the site. In order to provide the 800 kW of power required on site a 38-kV line (operated at 10 kV) was run from Naas, Co. Kildare.

At the end of the pressure tunnel a surge tank has been constructed to prevent dangerous stresses developing in the pipe-lines or tunnel as a consequence of a sudden alteration in the load of the power station. On full load the velocity in the tunnel will be 4 metres per sec. (i.e., 7,300 tons of water).

Up to twenty million gallons of water per day may be taken for the public water supply in Dublin. This represents 10 per cent. of the run-off at Poulaphouca and slightly exceeds the present requirements of the city. For this supply the Dublin Corporation will pay the Electricity Supply Board £128,000. The Corporation's intake is about 100 yds. above that of the Electricity Supply Board.

Subsequent to the termination of the Liffey investigations an inquiry into the hydro-electric potentialities of various Irish rivers was begun and certain possible power sites have been selected. Arrangements have been made for the keeping of flow records and automatic recorders have been installed on the Rivers Erne, Boyne and Lee.

STEAM CONDENSERS

Design and Operation

By Vernon Walker, A.M.I.E.E.

THE frequency of cleaning condensers and the methods employed vary with the local conditions of individual installations. Unfavourable summer conditions in some cases require repeated tube cleaning with correspondingly longer intervals between cleaning during the winter.

Cleaning devices used depend on the type of deposit. Compressed air alone, compressed air and water and high-velocity water jibs have given satisfying results. Various types of rubber plugs and small bristle brushes, in conjunction with compressed air and water, and brushing by hand also find favour. Intermittent chlorination of circulating water is used at many stations, apparently without detrimental effects, although in one case it was found necessary to discontinue the use of the equipment during the winter as the chlorine appeared to dissolve metal when its surface was metallically clean. Chlorination equipment was therefore taken out of service when the circulating water inlet temperature fell to 60 deg. F. and placed in service when the temperature rose to 65 deg. Other methods employed to keep tubes clean are sand blasting, washing with water and reversing the flow of water through the condenser.

Matter causing fouling of condenser tubes includes algae, calcium carbonate scale, mud, slime, silt, sewage, shells, sand, cinders, small stones, leaves, sticks and bay cabbage. In the majority of cases cast-iron circulating piping is installed and a coat of bitumastic paint has been found to give satisfactory protection against the effects of salt water. The protective coating on new steel piping consists externally of one coat of bitumastic primer, applied cold, then one hand-brushed coat of enamel, followed by a wrapping of tar saturated felt, then a second coat of bitumastic enamel, followed by a second wrapping of tar saturated felt. The interior surface first received one coat of bitumastic primer applied cold, followed by two hand-brushed coats of bitumastic enamel applied hot. An inspection after six months' service disclosed that the protective coating had started dropping off in several places within the discharge pipe.

Causes of Noise

Vibration of circulating water piping connected to condensers is seldom experienced, but vibration between the circulating pump and condenser has been caused by a sharp elbow; this was eliminated by the installation of guide vanes within the elbow.

Noisy operation has often been caused by foreign matter lodging in the circulating-pump impeller and also by a large whirlpool admitting air to the pumps. Baffles placed in the suction bell mouth overcame the difficulty in this case. Bronze impellers dealing with both salt and fresh water are liable to both erosion and corrosion. Excessive wear appears at the inlet edge of the impeller as well as at the middle and lips of the blades. Cast-iron pump casings are also liable to erosion, but in some cases where bronze impellers have failed, no trouble has been experienced with the casings, and in others where impellers have not failed the trouble has been confined to the casings. Repairs to pump casings have been made by inserting stainless steel screws and filling in the voids with stainless steel welds over the screws. Impeller blades have been repaired by brazing and electric welding with copper wire.

The electrolytic conductivity test of ascertaining condenser leakage is becoming popular where fresh water is used. The method involves the determination by an electrical instrument of the conductance or resistance to the flow of current between electrodes inserted in samples of condensate and circulating water. The silver nitre test is successfully used when using brackish water. A make-up meter and temperature of condensate test is also a means of ascertaining leakage. The maximum permissible leakage depends on the kind of circulating water used and the operating pressure of the boilers and may vary between 0.1 and 1 per cent. of the condensate.

Condenser Leakage

The source of condenser leakage is generally traced either by filling the steam space with water and making an inspection through the water boxes or by "candling" the tubes, that is building up a vacuum within the condenser and testing for leakage by means of a taper. For divided water boxes the latter method is employed with the proper condenser section cut out and the unit in service. Where tubes are the cause of leakage the general practice is to insert tapered wooden plugs in the tube ends. If ferrules are used these can be removed and a brass plug screwed in the tube sheet. To stop condenser leakage temporarily, sawdust injected into the circulating water has given good results.

From data collected by the Edison Electric Institute it appears that tube failure is mainly caused by corrosion or erosion of the inlet tubes as a result of turbulence in the condenser water boxes, air impingement at the tube entrance and also high velocity of the water flowing through the tubes.

To increase the life of the tubes care has been taken to prevent the entrance of air into the suction pipes and packing of the circulating pumps and to remove the air by vents at the highest points of the circulating water piping and from the water boxes. The water flow conditions at the entrance of the tubes has also been improved by the elimination of ferrules, by expanding and flaring the tubes into the tube sheet or, if ferrules are used, by reducing their projection into the water boxes and, in some cases, eliminating the wrench slots and improving entrance contours. Failure of tubes near the expanded ends has sometimes been attributed to vibration caused by impingement of high-velocity steam. These failures have been reduced by strapping the outside tubes together with several rows of clamps or by installing a screen in the steam space to break the velocity of the steam and water striking the tubes.

Admiralty tubes are used for practically all water conditions. Aluminium brass and aluminium bronze have been found to give superior service with salt water. In other cases arsenical copper containing 0.15 per cent. arsenic has been found satisfactory, especially in fresh water installations where trouble from dezincification has been experienced.

The expanding of tubes into the tube sheets at both ends is favoured in American practice and has proved to be a factor in the elimination of condensate contamination. Expanded tubes are used with fixed tube sheets when the tube lengths are sufficient to absorb expansion and contraction; otherwise an expansion joint is built into the shell or interposed between the shell and one tube sheet. In this country expanding and bellmouthing the tubes at the inlet ends with packing at the other end is becoming usual. Two-pass condensers are finding favour in both British and American practice and an increasing number are furnished with divided water boxes.

Connection between the turbine exhaust and condenser is in many cases made rigid by a flanged joint, the condenser being mounted on springs. Rubber expansion joints have been found satisfactory in America, but there is very little information as to experience in welding the steel turbine casing to the steel condenser shell. It appears that vibration is a factor in deciding whether an expansion joint can be eliminated.

Prevention of Chafing

Chafing between tubes and tube supports is not peculiar to any type of installation. This trouble has been experienced at various turbine speeds and with a wide variation in the spacings of supports. The method of securing the tubes in the tube sheet does not appear to be a determining factor, as chafing has occurred when the tubes are expanded and where packing is used. The use of additional tube supports, the installing of a heavier gauge tube around the periphery of the tube bundle and the strapping together of outside tubes are among the various correcting measures adopted.

Steel tube plates are used in place of Muntz metal or brass because of the lower cost, and experience in America has shown that with certain water their resistance to corrosion is entirely satisfactory. Three condensers of 33,000 sq. ft. for 35,000-kW turbines of the Consumers' Power Co. are equipped with arsenical copper tubes expanded at both ends to copper-bearing steel tube sheets. These are the largest condensers in the world to be equipped with steel tube sheets. Welded steel plate construction for condenser shells is becoming accepted practice. In the majority of cases, however, the use of cast-iron for water boxes and covers is continued. Steel shells give the benefit of a material having a closer grain structure, thus reducing possibility of air leakage and, in addition, eliminating a number of flanged joints, which are also a possible source of leakage.

The Future of Distribution

IN a paper entitled "Distribution is Meeting Its Responsibilities" read at the 140 Convention of the Edison Electric Institute, Mr. H. P. Seelye (Detroit Edison Co.) considered that it was possible that the use of underground facilities would increase in the United States. This would be caused not only by the desire to improve the appearance of streets and other property, which was likely to be a factor, but also by the increasing congestion of lines which accompanied larger loading. It was improbable, however, that the cost of underground distribution would ever approach very closely to the low cost of overhead distribution which had been a major element in the rapid expansion in the use of electric power in the past. No radical changes in materials or methods could be foreseen which would lead to major reductions in the cost of distribution. The solution of the problem of reducing costs lay largely in the commercial departments, in increasing the load per customer and the use of energy.

PROGRESS IN SOUTH AFRICA

Annual Report of the Electricity Supply Commission

IN view of the present war conditions the Electricity Supply Commission of South Africa has considered it advisable to issue its report for 1939 in a somewhat briefer form and to deal only with the salient features of its activities.

The unsettled state of affairs in Europe early in the year and the possible repercussions in South Africa led the Commission to take the necessary measures for the safeguarding of the continuity of the supply of electricity from its undertakings, so that on the outbreak of war the Commission was properly prepared for any eventualities.

During the year a new record of production of electricity was achieved, the total output from the six main generating stations and three standby generating stations amounting to 3,762 million kWh, an increase of 18.5 per cent. as compared with the preceding year. An increase of 171,926 kW in the generating capacity of the stations during 1939 brought the total installed capacity at December 31st last to 954,156 kW. The Klip generating station was brought into commission and the construction of the Vaal station was inaugurated in March, 1939. To assure adequate reserve capacity for the Natal undertaking it was decided to install an additional 25,000-kW generator at the Colenso power station and the set is now on order. Construction of the extensions to the Congella station at Durban was commenced, while the new Table Bay station of the Cape Town Municipality began commercial operation. Since the completion of the latter it has assumed the rôle of a base-load station. Until that time the Salt River power station of the Commission had been the chief generator under a pooling agreement between the Commission and the Cape Town Municipality.

Dr. H. J. Van der Bijl, chairman of the Electricity Supply Commission of South Africa

Expenditure on capital account during the year amounted to £1,174,054, which brought the total expenditure at December 31st up to £18,322,538. Expenditure on major works under construction and on minor extensions will bring the total expenditure on capital account to approximately £23,000,000. The total revenue at £2,630,473 was £398,451 or 18 per cent. above the 1938 figure, while the total production costs (including interest, redemption and reserve fund charges, but excluding a portion of the Salt River power station costs paid under a pooling agreement) came to £2,625,702, as against £2,218,696, an increase of 18 per cent. also. This left a surplus of £4,771—£8,555 less than in 1938.

Cheaper Electricity

The average price per kWh sold was reduced from 0.176d. to 0.172d., and the average revenue per kWh sold from 0.179d. to 0.176d. Actually in the past four years the average price per kWh sold has been reduced by 0.094d. A fall in the total cost of the coal consumed from £789,805 to £752,707 was due largely to the decrease in the tonnage of coal consumed at the Salt River station, consequent on the coming into operation of the new pooled station at Table Bay.

There was an increase in the sales of electricity from all the Commission's undertakings amounting to 19.7 per cent., the total sales being 3,574 million kWh, 588 million kWh more than in 1938. Of this total the Klip undertaking was responsible for 2,193 million kWh (526 million increase). Witbank sold 768 million kWh (a very slight decrease), Natal Central 266 million kWh (31 million kWh increase), Durban 234 million kWh (24 million kWh increase), Cape Town (excluding supplies under the pooling agreement) 106 million kWh (8 million kWh increase), and Sabio 6 million kWh (nearly a million decrease).

The increase in consumption of electrical energy was spread over all classes of consumers. The largest increase was for domestic use and street lighting (from 10.5 million to 14 million kWh), the other advances being as follows:—Direct supplies for industrial purposes from 83.9 million to 103.2 million kWh; bulk supplies for mining, from 2,290.5 million to 2,780.4 million kWh; traction, from 308.9 million to 361.9 million kWh; direct supplies for mining, from 40.5 million to 44.1 million kWh; and bulk supplies for municipal purposes, from 251.1 million to 270.1 million kWh. The total consumption of electricity on the Reef by the gold mining and other industries, municipalities, etc., exceeded 4,872 million kWh, of which approximately 63 per cent. was supplied from the Commission's stations at Klip and Witbank, the balance being provided by stations owned by the Victoria Falls and Transvaal Power Co., Ltd., three mining companies and the Johannesburg Municipality. A large proportion of the electricity supplied in bulk to municipalities was used for domestic and lighting purposes.

Overseas conditions led to a delay in the delivery of the two double unit mercury arc rectifier plants for sub-stations on the Rossburgh-Hillcrest section of the Natal old main railway line, which is being converted to electric traction. Delivery, however, is expected towards the end of 1940, but it is not anticipated that this section will be operated electrically until towards the end of 1941. Early in 1940 the Railway Administration requested the Commission to provide five new traction sub-stations on the Reef to cope with the rapidly increasing traffic requirements.

The Mineral Line linking Canada Junction with Jupiter through the southern suburbs of Johannesburg was partially converted to electric traction at the beginning of 1940. The Booysens sub-station came into commercial operation on February 2nd, and electric traction is now employed on the section between Canada Junction and Village Main. Previously the Pretoria and Pinedene sub-stations on the Germiston-Pretoria electrified section were fed only from the Pretoria power station, but a duplicate source of supply is now available from the lines of the Victoria Falls and Transvaal Power Co., Ltd., at Olifantsfontein. The total mileage of electrified railway lines in the Union of South Africa is: Route miles 605, or 1,232 miles single track equivalent.

Rural Development

The Commission's policy of making electricity available wherever practicable to inhabitants of rural areas was furthered during the year. As previously reported, the Commission decided to embark upon a scheme for supplying farms contiguous to the electrified railway system in Natal from an 11-kV power line to be erected on the track structures, and tapped at suitable points.

Sections of the line have been, or are now being, constructed to serve small communities or groups of farms. It will be realised that this development must be a gradual one, and its fulfilment will be spread over a number of years, and may be retarded by the war. There have been considerable extensions to the Commission's systems, notably on the South Coast of Natal, and in the Cape Western Province, which latter area may now be regarded as the most intensively electrified rural area in South Africa. The total number of towns and villages supplied with electricity by the Commission in the Union at December 31st was 95, and the number of farms supplied was 398, an increase of 14 and 43 respectively.

Steady Domestic Expansion

An increase, not only in the total sales of electricity for domestic consumption, but also in the consumption per consumer supplied direct by the Commission, took place in 1939. Total sales for domestic and street lighting uses increased from 10,520,028 kWh in 1938 to 13,990,173 kWh, while the annual consumption per consumer increased from 1,484 to 1,598 kWh. In view of the fact that many of these consumers, who now total 8,756, live in small and often isolated rural communities, this increase is regarded as satisfactory. An increase of over 33 per cent. in energy sold for domestic purposes by the Cape Town undertaking is noteworthy.

Of the sixteen local authorities taking bulk supplies from the Commission to a total of 270 million kWh, the largest consumer was the Durban Municipality. Since the beginning of 1940 the municipality of Port Shepstone has taken a bulk supply of electricity from the Commission's Durban undertaking

---

American Defence Inventions

THE *Edison Electric Institute Bulletin* says that a special division of the American National Inventors' Council is to be organised shortly to receive, catalogue and evaluate electrical inventions submitted to aid in national defence. The Council expects to establish permanent offices in the Commerce Department Building in Washington to act as a clearing house for all civilian suggestions for improving defence weapons. A skilled technical staff will be named to consider all submitted inventions and the Council is preparing to handle upward of 100,000 ideas a year. Other divisions of the staff will be established to study inventions in the chemical and mechanical fields.

In addition to receiving civilian ideas, the Council also will accept specific assignments from defence officials and relay these to skilled inventions considered best equipped to find the needed solutions. Dr. William D. Coolidge, director of the General Electric Research Laboratories, is the member of the council particularly interested in the electrical field.

ABSOLUTE UNITS

The M.K.S. (Giorgi) System

By "Sliderule"

IN October, 1933, the International Electrotechnical Commission invited opinions from its national committees on the question of extending the series of practical units employed in electrical technology by incorporating it in a coherent system of absolute units based on the metre, the kilogramme and the second as fundamental units of length, mass and time, and having as the necessary fourth fundamental unit either the ohm (10^9 c.g.s. units of resistance) or the corresponding value of the permeability of free space (μ_0).

In the same year the eighth Conférence Générale des Poids et Mésures (representing thirty-six countries) sanctioned the substitution of the absolute system of electrical units for the hitherto legally recognised "international" system, and it furthermore authorised its International Committee of Weights and Measures to determine the ratios between the two sets of units and to fix the date at which the change should be made. At its plenary meeting at Scheveningen in 1935 the I.E.C. unanimously adopted the M.K.S. system of absolute units, and confirmed the decision at the Torquay meeting in 1938. In the same year the I.C.W.M. decided that the change-over should take place on January 1st, 1940, and but for the war, which caused the carrying out of this intention to be indefinitely postponed, the absolute units would have become the internationally recognised legal standards of measurement.

The I.E.C. decision, in effect, replaces the three systems in use—the absolute electromagnetic C.G.S. system, the absolute electrostatic C.G.S. system, and the practical system of units—by one absolute system, nine of whose units are identical with the practical units which have long been used by electrical engineers. Five of these units, the coulomb, the ampere, the volt, the ohm and the farad, were adopted at the first International Electrical Congress in 1881. The joule, the watt and the henry were added at the next three congresses, while the weber was adopted by the I.E.C. as the practical unit of magnetic flux in 1933.

The M.K.S. Units

Under the absolute system the legal ampere is no longer that current which deposits 1.118 mgm. of silver per sec. when passed through a solution of silver nitrate, but that current which, when flowing round a circular loop of wire of 1 metre radius, will exert a force of 0.5 newton (=1/9 lb. approximately) on an M.K.S. unit pole*, i.e., a magnetic pole from which issues a flux of 1 weber, placed at the centre of the loop. The difference between the old (international) and the new (absolute) units, although of importance from the point of view of legal definitions and standardisation, is fortunately too small to require changes of a numerical nature in the majority of engineering applications. For example, the difference between the absolute and the international ampere is only one part in ten thousand.

The M.K.S. system was first put forward in 1901 by Prof. Giorgi, who proposed the permeability of free space (μ_0) as the fourth fundamental unit, alongside the metre, the kilogramme and the second, to link up the electrical with the mechanical units. This fourth fundamental unit was adopted by the I.E.C. in 1938 together with "newton" for the M.K.S. unit of force.

The fundamental units (L, M, T) of the M.K.S. system, viz., the metre, the kilogramme and the second, are respectively 100 cm., 1,000 gm. and 1 sec. in the C.G.S. system, and 3.28 ft., 2.205 lb. and 1 sec. in the F.P.S. system. Other important mechanical units are those of force (F), energy (W), and power (P), for which the newton (joule per m.), the joule and the watt of the M.K.S. system are equivalent to 10^5 dynes (ergs per cm.), 10^7 ergs (dyne-cm.) and 10^7 ergs per sec. in the C.G.S. system and 7.23 poundals, 23.73 ft.-poundals and 1/746 HP in the F.P.S. system. The relations between the M.K.S. and the C.G.S. electromagnetic and electrostatic systems are given in the accompanying table.

In the second and third sections of the table the quantities applicable to electromagnetics and electrostatics depend for their unit M.K.S. values on the value chosen for μ_0. The corresponding value of ϵ_0, the permittivity of free space, is then fixed by the fundamental relation $\sqrt{(\mu_0\epsilon_0)}=1/c$, where c is the velocity of light. Take, for example, the unit of magnetic field strength or magnetising force H. For a vacuum or any non-magnetic medium we write B=H, but that does not mean that flux density is the same as field strength.

This source of confusion was finally disposed of in 1930 by the I.E.C. Convention at Oslo, when it decided that B and H were physically different and that henceforth B would be measured in gauss and H in oersteds. Under these circumstances we ought to write $B=\mu_0 H$, where $\mu_0=1$ in the C.G.S. system of absolute units. Although no name has been assigned to the C.G.S. unit of permeability it evidently has the dimensions of "gauss per oersted."† In the case of a magnetic medium when we write $B=\mu H$ we really mean $B=(\mu/\mu_0)\times(\mu_0 H)$ = (relative permeability) × (flux density in vacuo). In the C.G.S. system of units, μ_0 is suppressed in the above equation as it is numerically equal to unity.

In the M.K.S. system, on the other hand, the permeability of free space may either have the value $\mu_0=4\pi\times10^{-7}$ or $\mu_0=10^{-7}$, leading to the so-called rationalised and unrationalised forms of the M.K.S. system respectively. International agreement on this point has not yet been reached. In general physicists prefer the unrationalised system, which runs exactly parallel with the classical C.G.S. system. Engineers, however, favour the rationalised system as it eliminates the awkward factor 4π. There is much to be said for having

Equivalence of Electrical Units

Quantity	Symbol	M.K.S. system	C.G.S. System = EMU multiplied by	C.G.S. System = ESU multiplied by
Quantity ...	Q	1 coulomb (amp.-sec.)	10^{-1}	3×10^9
Current	I	1 ampere ...	10^{-1}	3×10^9
Electromotive force.	E	1 volt	10^8	1/300
Power	P	1 watt	10^7 (erg. per sec.)	10^7 (erg. per sec.)
Energy	W	1 joule	10^7 (ergs) ...	10^7 (ergs)
Resistance ...	R	1 ohm	10^9	1.11×10^{-12}
Conductance ...	G	1 siemens (mho)	10^{-9}	9×10^{11}
Inductance ...	L	1 henry... ...	10^8 (cm.) ...	1.11×10^{-12}
Capacitance ...	C	1 farad	10^{-9}	9×10^{11} (cm.)
Magnetic flux ...	Φ	1 weber(volt-sec)	maxwells $\times 10^8$	——
Magnetic flux density.	B	1 weber per sq. metre.	gauss $\times 10^4$ ...	——
Magnetic field strength	H	1 amp.-turn per metre.*	oersteds $\times 1/40\pi$	——
Permeability ...	μ	1 henry per metre (perm).*	$10^7/4\pi$	——
Electric flux density.	D	1 coulomb per sq. metre.*	——	$12\pi\times10^5$
Electric flux ...	Ψ	1 coulomb* ...	——	$12\pi\times10^9$
Electric field strength.	ϵ	1 volt per metre	——	3.33×10^{-5}
Permittivity ...	ϵ	1 farad per metre (dil).*	——	$36\pi\times10^9$
Space permeability.	μ_0	$4\pi\times10^{-7}$ henry per metre.*	1	——
Space permittivity.	ϵ_0	$10^{-9}/36\pi$ farad per metre.*	——	1 ... ...

* Rationalised M.K.S. System.
† One gauss per oersted = 10^{-8} henry per cm.

pole strength equal to magnetic flux, so that 1 weber of flux emerges from unit magnetic pole instead of from $1/4\pi$ of a unit pole. Similarly, in the rationalised M.K.S. system an electrostatic charge of one coulomb gives emergence to one coulomb of electric flux, instead of to 4π coulombs as in the unrationalised system.

The arguments in favour of the rationalised system are summed up by consideration of the equation for magnetising force or field strength. In the C.G.S. system it is H (oersteds) $= \dfrac{4\pi\times N\ (\text{turns})\times I\ (\text{e.g.s. units of current})}{l\ (\text{centimetres})}$. In the unrationalised M.K.S. system ($\mu_0=10^{-7}$) this becomes:—

$$H\ (\text{M.K.S. units}) = \frac{4\pi\times N\ (\text{turns})\times I\ (\text{amperes})}{l\ (\text{metres})}$$

so that the unit of field strength is 4π ampere-turns per metre. In the rationalised M.K.S. system ($\mu_0=4\pi\times10^{-7}$), on the other hand, the above equation becomes simply $H=NI/l$ with H expressed directly and conveniently in ampere-turns per metre as the M.K.S. unit.

Again, consider the basic equation of the magnetic circuit: (magnetomotive force) = (flux) × (reluctance). In the rationalised M.K.S. system the unit of magnetomotive force is the ampere-turn, which has always been the practical unit used by engineers. For we have F = Φ(webers) × R(ampere-turns per weber) $= \dfrac{\Phi\ (\text{webers})}{A\ (\text{sq. m.})} \times \dfrac{l\ (\text{metres})}{\mu\ (\text{henries per metre})}$

$= \dfrac{B\ (\text{webers per sq. m.})}{\mu\ (\text{henries per metre})} \times l\ (\text{metres}) = H\ (\text{ampere-turns per metre}) \times l\ (\text{metres}) = Hl\ (\text{ampere-turns}).$

In the unrationalised system the M.K.S. unit is 4π ampere-turns, or 10 C.G.S. units of magnetomotive force (gilbert). For in the C.G.S. system we have F = Φ(maxwells) × R(c.g.s. units) $= \dfrac{\Phi\ (\text{maxwells})}{A\ (\text{sq. cm.})} \times l\ (\text{cm.}) = \dfrac{B\ (\text{gauss})}{\mu} \times l = H\ (\text{oersteds}) \times l =$ Hl (gilberts); or $F = \dfrac{4\pi}{10} \times \dfrac{NI}{l}$ (ampere-turns per cm.) × l (cm.) $= \dfrac{4\pi}{10} \times NI$ (ampere-turns).

(Concluded at foot of next page.)

RESUSCITATION FROM SHOCK

Comparison of Methods

By G. H. Bell, B.Sc., M.B. and J. A. C. Knox, M.B.
(*Institute of Physiology, University of Glasgow*)

IN a recent issue of the ELECTICAL REVIEW Professor Jellinek discussed the causes of death from electric shock and also recommended a new method of artificial respiration which he first described in 1935. New methods of artificial respiration have been invented at an alarming rate in the last few years—some good and some bad. It behoves us, therefore, to be careful to distinguish between the latest and the best. The older methods are well established and well tried out. A large number of people have been trained in their use and for this reason they should not be lightly discarded. But when a man of Professor Jellinek's undoubted reputation describes a method it certainly must be looked into. As most readers of the ELECTRICAL REVIEW are interested in electrical and not medical science they will not usually be in a position to judge between a desirable and an undesirable method of artificial respiration. It was for the protection of the unsuspecting reader that this little inquiry was undertaken.

It is difficult to estimate the merits of any method of artificial respiration, for the simple reason that we cannot produce "electrocuted" or drowned persons as required in the laboratory. Experiments on animals are no substitute. We must then fall back on the use of subjects who have trained

Table showing volume of air expired (in litres per minute at N.T.P.) in normal breathing and in artificial respiration by the Jellinek and Schäfer methods. The figures in brackets indicate the time for which the method could be tolerated.

Subject	Normal Respiration Subject Lying on Back	Artificial Respiration	
		Jellinek Method	Schäfer Method
G.H.B.	6.33 l./min.	4.76 l./min. (45 secs.)	6.93 l./min. (3 min.—indef.)
J.A.C.K.	5.13 l./min.	2.18 l./min. (68 secs.)	6.73 l./min. (3 min.—indef.)
J.R.B.	7.90 l./min.	2.59 l./min. (23 secs.)	6.37 l./min. (3 min.—indef.)
D.T.	8.43 l./min.	4.0 l./min. (75 secs.)	9.1 l./min. (3 min.—indef.)

themselves to relax their muscles as far as possible, especially the muscles of respiration. When the operator tries an artificial respiration method the subject must try to remain relaxed and let the operator take over control of his chest muscles and his diaphragm.

Measuring Respiration

The first desideratum is that sufficient air should be made to move in and out of the chest. If the ventilation of the lungs is adequate then the subject will not require to make any voluntary breathing movements; if the ventilation is insufficient then after a little the subject will be compelled to take a breath out of the rhythm of the operator's movements. It is possible, therefore, to compare methods of artificial respiration by trying them on trained subjects and studying the subjective results. In order to give figures which can readily be compared, the volume of air breathed out of the chest may be measured. The method of measuring the amount of air breathed out is described in all textbooks of physiology and need not be gone into here.

The procedure we adopted was as follows. The subject lay on his back with a pillow between his shoulders, as Prof. Jellinek recommends, and after a short pause the air expired during three minutes was collected and measured. It is expressed as litres per minute at N.T.P. in the first column of the table. Then Prof. Jellinek's method of artificial respiration was carried out. This consists in pushing the shoulders forcibly backwards towards the ground thus bending back the vertebral column. It was our original intention to collect the expired air over a three-minute period of artificial respiration, but this turned out to be impossible as the subjects complained that not enough air was inspired for comfort and the experiment could only be tolerated for about 50 seconds on the average. The actual times are given in brackets in column 2 of the table. For the sake of comparison with the values in the other columns the air expired under the Jellinek procedure is expressed in litres per minute.

Finally the method advocated by Schäfer (1904) was applied for three minutes. The volume of air expired per minute is given in the third column of the table. All the subjects said that they received sufficient air and that they could have tolerated the method indefinitely.

Extreme Discomfort

In assessing a method of artificial respiration several considerations arise. The table shows that the Jellinek method does not bring about adequate entry of air into the lungs. In every case the ventilation per minute produced by the Jellinek method falls considerably short of the normal, whereas by Schäfer's method volumes in excess of the normal were produced in three cases out of four.

Furthermore the movements involved in artificial respiration should be so designed as to avoid damage to the organs of the body. None of the subjects tolerated the Jellinek procedure for more than 75 seconds, because of want of air and because of extreme discomfort, due to the stretching of the chest and neck muscles. They also found it difficult to swallow saliva because of the bent back position of the head.

The exact position of the pad supporting the back seems of importance in Jellinek's procedure. As the artificial respiration proceeded the pad tended to slip down into the small of the back, the shoulders approached the ground and the ventilation became very small indeed. With the Schäfer method on the other hand, all the subjects said that they were quite comfortable during the full period of three minutes, and that they could have tolerated it indefinitely. Undoubtedly the prone position (lying on the belly) is much more suitable for drainage of the respiratory passages than the supine position used in Jellinek's procedure.

Students Likely to Object

Again, it is most important that people should be trained in a method of artificial respiration so that if any emergency arises the victims may receive prompt and satisfactory attention. In teaching procedures it is usual for one of each pair of students to act as subject while the other acts as operator. This is the regular procedure in teaching Schäfer's method. We are convinced that if this method of teaching were applied to Jellinek's procedure there would be a great volume of disapprobation from its victims, which would count for more than any academic inquiry in the balance of condemnation.

The method of Schäfer is simple, effective, safe, and easily learned. It has been in use in this country for many years and we know of no reason to discard it.

References

S. Jellinek, "Nouvelle Méthode de Respiration Artificielle." Bruxelles-Medical. 1935, 15, 431.

S. Jellinek, "Resuscitation from Shock." ELECTRICAL REVIEW. January 5th, 1940, p. 10.

E. A. Schäfer, "Medico-chirurgical Transactions." 1904, 87, 609.

Absolute Units (*Concluded from preceding page*)

Whether the I.E.C. will finally adopt the rationalised form of the M.K.S. system as the standard form depends upon whether the engineers will prevail over the physicists. Giorgi himself originally recommended rationalisation. The I.E.C. in 1938 wisely agreed to leave this controversial question in abeyance. At present writers are free to use the M.K.S. system either in its rationalised or unrationalised form; but it then becomes incumbent upon them to indicate clearly which they employ. So far only the newer American textbooks, e.g., Woodruff's "Principles of Electric Power Transmission" (2nd edition), seem wholeheartedly to have accepted the rationalised M.K.S. system. On this side of the Atlantic Professor Marchant's recent "Introduction to Electrical Engineering" teaches both the C.G.S. and the M.K.S. systems, a policy which has the undoubted advantage of driving home the fundamental concepts of electricity and magnetism.

A Dangerous Installation

THE *New Zealand Electrical Journal* states that at a meeting of the Electrical Wiremen's Registration Board in June a Dunedin canvasser was charged with installing electrical conductors and an accessory and was fined £2 and ordered to pay costs amounting to £2 12s. The supply authority reported that a washing machine was connected to a bathroom light by means of a lampholder adaptor, 40 ft. of two-core flexible cord running across the yard to the wash-house and a three-pin cord-connector. From the earthing contact of the cord-connector about four inches of an earthing-lead were hanging, and a piece of earthing-lead was connected to a water-pipe.

When persons used the washing-machine they were supposed to twist the two pieces of earthing-lead together. The water supply to the house was from tanks, and the machine was not connected to earth.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters interest for this page are welcomed

THE new session's chairman of the Mersey and North Wales (Liverpool) Centre of the I.E.E. is **Mr. J. E. Nelson**, who was educated at the Liverpool Institute and received his early training at the works of Cochran & Co., and Cammell Laird, followed by a course at Liverpool University. He was then employed for two years by the London Underground Railways on plans for their power station and in connection with the London tube railways before receiving an appointment with the Yorkshire Electric Power Co. in 1902. He remained with the Yorkshire Electric Power Co. in various capacities until 1911, when he was appointed to the position of engineer to the Mersey Power Co. at its inception. Mr. Nelson has remained as chief executive officer with the Mersey Power Co. from the date of his appointment to the present time and now holds the position of chief engineer and manager. He is also a director of the Mersey Power Co. and of its associate company, the Mid-Cheshire Electricity Supply Co. He has been responsible for the management of his company from its commencement through successive stages of development, including the construction of two power stations; the first was completed in 1921 and extended in 1926, comprising 37,500 kW of plant, and a later extension comprised 90,000 kW of plant. The area supplied is approximately 100 square miles and the sales in 1939 were nearly 750 kWh per head of the population.

Mr. J. E. Nelson

Mr. G. E. Bailey, Metropolitan-Vickers Electrical Co., Ltd., and **Mr. D'Arcy Madden,** Hick, Hargreaves & Co., Ltd., have joined the North-Western Area Advisory Board set up by the Minister of Supply. One of the functions of the Board is to advise small engineering concerns as to their ability to undertake Government contracts.

Mr. C. N. Bancroft, mains and technical assistant with the Pontypridd U.D.C. Electricity Department, has been appointed electrical engineer to the Council in succession to Mr. G. J. Evans.

Mr. E. Hall, constructional assistant with Grimsby Corporation Electricity Department, is leaving Grimsby temporarily to carry out special work for Blackburn Corporation Electricity Department. The *Grimsby Evening Telegraph* reports that at a recent meeting of the Electricity Committee the engineer and manager (Mr. S. R. Windle) said that application had been made by the electrical engineer at Blackburn for the loan of Mr. Hall's services in order to assist in carrying out a comprehensive extension to the works plant at Blackburn, consisting of the installation of a large turbo-alternator and steam-raising and contingent plant, similar to a scheme recently carried through at Grimsby.

Mr. J. A. McCulloch has resigned the secretaryship of R. and W. Hawthorn Leslie & Co., Ltd., Newcastle-on-Tyne. He was appointed confidential clerk to the late Sir Robert Rowell when he was managing director of the firm in 1902, became assistant secretary at the head office in 1917, and two years later succeeded the late Mr. B. C. Browne as secretary.

Mr. W. J. Evans who, as we briefly reported in our last issue, has been appointed chief engineer of the Cardiff Corporation transport services, received his technical training at Faraday House, where he gained honours in the final examination. He joined the General Electric Co., Ltd., at Witton, as traction outside erection engineer, and in 1926 was appointed chief assistant engineer in the company's traction erection contracts department, supervising the erection, testing and maintenance of equipments for the L.B. & S.C. Railway, the London Electric Railway, and the Manchester and Altrincham Joint Railway.

Mr. W. J. Evans

From 1930 to 1935 he acted as liaison engineer on G.E.C.-Leyland contracts for trolley-buses, and among other contracts was connected with work executed for the London Passenger Transport Board and the Birmingham and Nottingham Corporation Transport Departments. In 1935 he joined the Rotherham Corporation as rolling stock and overhead line engineer, where extensive alterations to the running sheds and the building of new workshops costing approximately £70,000 have been undertaken and completed under his supervision.

Mr. Evans is an associate member of the Institution of Electrical Engineers and of the Institute of Transport.

Mr. G. R. Spurr, borough electrical engineer of Walthamstow, is to retire on pension at the end of the current year after thirty-four years' service with the Corporation.

Mr. Price F. White, who has just retired on superannuation from the post of borough electrical engineer to the Bangor Corporation, after forty-one years' service in that capacity, received his technical education at the Electrical Engineering Department of the University College of North Wales. In 1892 he entered the service of the Electric Light and Power Department of the General Post Office in London, where he was employed until 1899, when he was appointed engineer at Bangor. He has acted as consulting engineer to numerous local authorities in North Wales and was responsible for the preparation and the carrying out of electricity schemes for the local authorities in Holyhead, Caernarvon, Conway, Penmaenmawr and Llanfairfechan. He has also acted in an advisory capacity to many other public bodies in the area.

Mr. Price F. White

Mr. White has been a member of the North Wales and South Cheshire Joint Electricity Authority since 1929 and is the chairman of the General Purposes Committee of that body. He will continue his membership of the Authority. He was one of the founders of the North Wales and South Cheshire Local Authorities Electrical Undertakings Association and was the honorary secretary of the Association up to his recent resignation of that office.

He is succeeded as secretary of the Association by Mr. C. G. Morris, borough treasurer of Wrexham. He was a member of the I.M.E.A. Council in 1933-36 and 1938-39 and was chairman of the Bulk Supply Committee of the I.M.E.A. from 1935-36. He was one of the two members of the I.M.E.A. Council selected to submit the views of the I.M.E.A., on proposals for the reorganisation of the supply industry to McGowan Committee. When, in 1933, it was found that the implementing of Section 12 of the Electricity (Supply) Act of 1926 would result in onerous terms for the indirect supply takers in North Wales and South Cheshire area and in other parts of the country, Mr. White took a prominent part in the negotiations and conferences, which ultimately resulted in Section 12 of the 1926 Act being amended by Section 3 of the Electricity (Supply) Act of 1935. Following the issue by the Electricity Commissioners of the White Paper on the reorganisation of electrical distribution, the Association of which he was secretary considered various schemes for reorganisation in its area and finally submitted to the Commissioners proposals for setting up an Authority for the whole of the area, based on complete public ownership and control.

As we have already reported, Mr. White is succeeded by Mr. F. O. Harber, formerly electrical engineer to the Portland Urban District Council.

Obituary

Mr. T. Roles.—It is with regret that we have to record the death on September 9th of Mr. Thomas Roles, who was so well-known throughout the electrical industry as city electrical engineer at Bradford, from which position he only retired in June last.

Born at Brighton in 1875, he was educated at Brighton Technical School and received his electrical training with the Electrical Supplies & Fittings Co., Ltd., and Crompton & Co. His first post was as junior assistant with the Hove Electric Lighting Co., Ltd., which he joined in 1893. Two years later he was appointed assistant electrical engineer at Aberdeen, and in 1897 he became draughtsman, and later mains engineer, at Leicester. In 1900 he went to Poplar as generating engineer and four years later commenced his association with the Bradford electricity undertaking as chief assistant electrical engineer, becoming city electrical engineer and manager in 1907.

The late Mr. T. Roles

He was a strong advocate of cheap electricity supplies for domestic purposes and was one of the pioneers of the "Point Five" group. He was also a pioneer in this country of high pressure steam, and installed 1,100 lb. boilers at Bradford.

Mr. Roles was a member of the I.E.E., and was a past-chairman of the North Midland Centre of the Institution. He was also a member of the Institute of Fuel, a member of the National Consultative Committee appointed by the Central Electricity Board, and member of the Council and a past-president of the I.M.E.A., and a member of the Council of E.D.A.

Mr. P. V. McMahon.—We regret to learn of the death of Mr. Peter Valentine McMahon, M.Inst.C.E., M.I.E.E., M.I.Mech.E., which occurred on September 14th at the age of seventy-two. Mr. McMahon was for many years engineer to the City & South London Railway Co.

Mr. W. C. Smart.—We regret to record the death, as a result of enemy action, of Mr. W. C. Smart, who was for many years head traveller of an important branch of the General Electric Co., Ltd. Mr. Smart was one of the oldest servants of the G.E.C., with whom he had completed nearly fifty-four years' service.

Mr. G. W. Somerville.—The funeral took place at Accrington on September 12th of Mr. Geo. W. Somerville, aged sixty-six, formerly head of the electrical department of Howard & Bullough's engineering works, prior to commencing practice on his own account as consulting engineer.

Mr. Frank Walburton, managing director of the Harland Engineering Co., Ltd., until his retirement two years ago, has died at Stirling, where he had lived for many years. A noted figure in the electrical and engineering industry, he held patents for many inventions.

THERMO-ELECTRIC COUPLES

Determining the Hot-junction Power of Pairs of Differing Metals at Various Temperatures

By L. P. Dudley

MODERN pyrometry is one of the branches of electrical science which make use of electro-motive-forces generated thermo-electrically. The fundamental principles involved are based on the observation of Seebeck, in 1826, that current will flow in a circuit composed of two pieces of wire made of dissimilar metals (say copper and iron, or antimony and bismuth) with two ends twisted together so that the junction can be heated in a flame while the other ends (in series with an indicating galvanometer) are kept relatively cool. That classic demonstration of the creation of an electro-motive-force at the coupled junction enabled Seebeck to compile a list of metals so arranged that a hot junction made up of any two will result in a flow of current from the earlier to the later metal according to their order of tabulation.

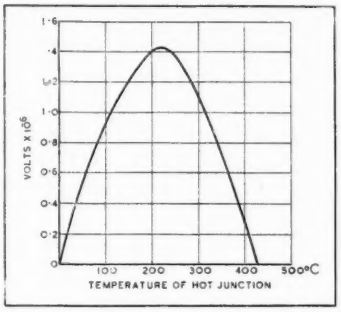


Fig. 1.—EMF-temperature curve for zinc-iron couple

The EMF produced by such a thermo-electric couple is not, as might at first be supposed, proportional to the excess of temperature of the hot junction over that of the rest of the circuit. Typical circuit performance (fig. 1) may be determined by means of the potentiometer method indicated diagrammatically in fig. 2.

The arrangement consists essentially of two similar variable resistance boxes R_1 and R_2 connected in series across a standard cell C, of known EMF. The thermo-electric couple is connected through a galvanometer G across the box R_1. The junction J_2 is immersed in ice in order to maintain it at a constant temperature, J_1 being raised to various temperatures. The fig. 1 curve was obtained with the junction J_2 maintained at 0 deg. C. The method of operation is similar to that of the ordinary resistance box potentiometer, the EMF of the thermo-electric couple being proportional to the resistance R_1 when the galvanometer deflection is zero, that is

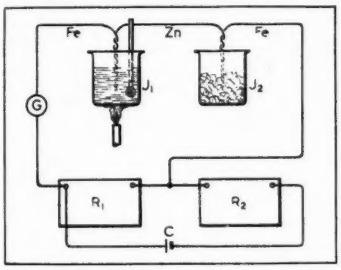


Fig. 2.—Potentiometer method of measuring thermo-electric EMF

$$\frac{\text{EMF of couple}}{\text{EMF of C}} = \frac{\text{Total resistance } in\ R_1}{\text{Total resistance } in\ R_1 \text{ and } R_2}$$

Tait's Diagram

The inclusion on one diagram of the fig. 1 type of the curves for all possible pairs of metals would lead to great confusion. It is, therefore, usual to adopt the method devised by Professor Tait.

Instead of plotting EMF against temperature, the EMF with unit difference of temperature between the junctions is plotted. The principle will be understood by reference to fig. 3. An ordinate, such as t_1 represents the EMF in the circuit of a couple when one junction is half a degree below and the other half a degree above $t°$, the average temperature thus being $t°$. In the case of practically all metals in pairs, the graph for any pair is a straight line, such as mn. In such a diagram, the EMF with one junction at $t_1°$ and the other at $t_2°$, the area t_1pqt_2 is a measure of the corresponding EMF in the circuit. This follows from the fact that the area of a small strip, such as that shown shaded in the diagram, is equal to the EMF, since its width is unity. Thus the sum of the areas of all such strips between t_1p and t_2q represents the total EMF.

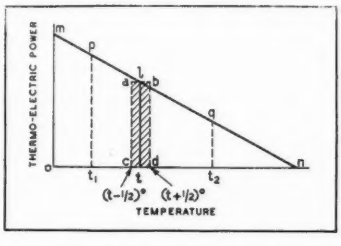


Fig. 3.—Principle of Tait's thermo-electric diagram

Line curves (such as mn in fig. 3) are drawn for the various metals, with lead as one element of the couple. By this means is obtained what is known as the "thermo-electric diagram" (fig. 4). The ordinate of each point on a given line is known as the "thermo-electric power" of the metal at that temperature.

One of the main uses for such a diagram is to enable the EMF to be determined for any pair of metals for any difference of temperature between the junctions. This will be made clear by reference to fig. 5 in which mn is the thermo-electric line for one metal and $m'n'$ is that for another metal, both being plotted with respect to lead.

Thus from fig. 3, for temperatures T_1 and T_2, the EMF of a couple consisting of the first metal and lead will be represented by the area T_1pqT_2 and for a couple consisting of the second metal and lead by the area $T_1p'q'T_2$. Therefore the EMF of a couple composed of the first and second metals is equal to the difference of these two areas, which is represented by the area $pp'q'q$.

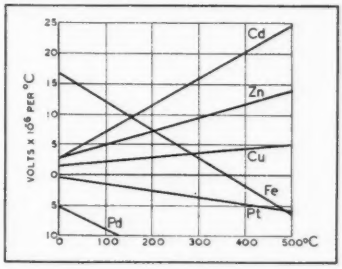


Fig. 4.—Thermo-electric diagram

There are other uses for the thermo-electric diagram, but a full discussion of its applications is outside the scope of the present article, and the interested reader is recommended to refer to one of the standard works on pyrometry.

The choice of metals and alloys suitable for commercial use as thermo-electric couples is somewhat restricted owing to the necessity of such metals being resistant to oxidation, recrystallisation, &c., at high temperatures. In addition, they must produce an EMF of sufficient magnitude to be measurable without the necessity of employing delicate apparatus.

Among the combinations of metals in common commercial use may be mentioned: platinum/87 per cent. platinum + 13 per cent. rhodium; platinum/90 per cent. platinum + 10 per cent. rhodium; "Chromel" / "Alumel"; iron / "Constantan" and copper/ "Constantan."

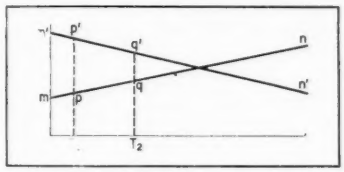


Fig. 5.—Illustrating use of thermo-electric diagram

Platinum/platinum-rhodium couples are satisfactory for use at temperatures up to about 2,800 deg. F., but are very readily contaminated unless adequately protected. The "Chromel"/"Alumel" couple is rather more satisfactory than iron/"Constantan" in oxidising atmospheres at temperatures between 1,200 and 2,200 deg. F. The copper/"Constantan" couple is found to be suitable for continuous working at temperatures up to about 700 deg. F.

The Peltier Effect

Whenever a current flows across a junction of two metals M_1 and M_2 heat is either absorbed or given out, being directly proportional to the current i and the time t for which the current flows. In this way the Peltier effect differs from the Joule effect in which the heat varies as i^2.

Putting all quantities in absolute units, one may state that the heat (in ergs) absorbed when a current i flows for time t from M_1 to M_2 is equal to

$$H = q\,i\,t.$$

If heat is given out, the multiplier q is negative. The actual value of q is dependent on the nature of the metals forming the junction and on the absolute temperature θ. This multiplier is usually positive for a particular range of values of θ and negative for another range, being zero at a temperature θ_n known as the "neutral point" for the metals concerned.

If the current is reversed, flowing from M_2 to M_1, the sign of the effect changes. Thus q is the energy reversibly supplied

per unit current per second, that is, the EMF at the junction.

Now consider a circuit of two metals M_1 and M_2 with junctions at temperatures θ and θ', the latter temperature being the lower. Assuming the current to flow from M_1 to M_2 at θ, the warmer junction will absorb a quantity of heat $H=q\,i\,t$. The current flows from M_2 to M_1 at θ', and the quantity of heat given out by the colder junction $H'=q'\,i\,t$.

Thus the total energy reversibly supplied is equal to $H-H'=(q-q')\,i\,t$. Therefore there exists a resultant EMF having a value of $q-q'$, available for driving a current round the circuit. Seebeck's experiments demonstrated the existence of this EMF.

The Thomson Effect

Lord Kelvin (then Sir Wm. Thomson) demonstrated the existence of an EMF between different parts of the same metal when the parts are at different temperatures. In the case of, for example, copper, the EMF causes a current to flow from the parts of lower to those of higher temperature, but in the reverse direction in the case of iron. Thus, if a copper rod is heated in the middle and a current passed through it, absorption of heat occurs as the current flows from the colder to the hotter parts and heat is given out as it flows from the parts of higher to those of lower temperature. The effect is reversed in the case of iron. The direction of slope of the thermo-electric line indicates the sign of the Thomson effect. There is no Thomson effect in the case of lead, this being the reason why it is customary to plot thermo-electric powers with respect to lead. It can be shown, on thermodynamic principles, that the resultant EMF in a given couple is equal to the algebraic sum of all the Peltier and Thomson EMFs.

The Manufacturer's Representative

Relations with Wholesalers

By J. Whitehead

SO many electrical accessories are now distributed solely through wholesalers that closer co-operation and more frequent meetings of the manufacturer and his distributors are necessary for the discussion of selling problems.

The electrical wholesaler handles so many lines in regular demand from his customers that it would be impossible for his salesman to learn all the details of every manufacturer's products. When the demand for the products of the manufacturer is created the wholesaler carries out his function of stockist for the many customers whom he serves and the uses and intricacies of the products are usually well demonstrated and explained to him by the manufacturer. A thorough campaign of introduction and education on the advantages and economies of any new or improved electrical accessory is carried out amongst the wholesaler's customers by the manufacturer's representative whose specialised knowledge enables him to give a good deal of valuable advice and helpful suggestions.

How to utilise to the utmost advantage the services of this technical representative is often a problem of the wholesaler. Obviously, the time which he can spend in visiting any wholesaler's customers is limited and his employers cannot afford to have him calling at random on each and every customer whether a prospective user of the product or not. His visits should always be made in company with the wholesaler's salesman, who is usually able to obtain for him a speedy introduction to the right man at each call, so that the maximum selling effort will result with a minimum of waste time.

The wholesaler's salesman can learn a great deal from the technical representative, which will assist him in his future selling. It is not meant to imply that he is not as good a salesman as the manufacturer's representative—he may be much better—but it must not be forgotten that years of specialisation on a product or a limited number of products provide experience which enables suggestions to be made and queries answered which the wholesaler's salesman could not be expected to know. Technical assistance to the ultimate user is the strong selling point of the manufacturer, whilst prompt service and quickly available local stocks are the wholesaler's strong points.

Intelligent Planning

Co-operation with the manufacturer is frowned upon by some wholesalers, who argue that the scheme for educating prospective customers is usually made without sufficient consideration of the wholesaler's plans, problems and interests. The manufacturer's plans have for their sole object the introduction and selling of his own products and do not take into account the many other items which constitute the "bread and butter" lines of the wholesaler—selling lines which he cannot afford to neglect. Intelligent planning of the educative campaign so that it conveniently fits in with the plans of both wholesaler and manufacturer can always be arranged, however, if both parties will meet and thoroughly discuss their difficulties before putting the campaign into operation.

Another point often raised by the wholesaler is that so many manufacturers are offering him the services of their technical representatives that it sometimes happens that his salesman is accompanied by one manufacturer's representative one week and by the representative of a manufacturer of a competitive article the following week, with the result that a prospect becomes uninterested and feels that his time is being wasted. The wholesaler has only himself to blame if such a situation arises. He cannot work efficiently with two manufacturers of the same products without the result being a selling effort so scattered that he does not do a proper selling job for either. He must decide which particular manufacturer's product will best serve the majority of his customers and concentrate his efforts on the sale of that product.

It is the practice of many manufacturers to allow their technical representatives to work alone, but refer prospective customers to a locally situated wholesaler holding stocks of the manufacturer's product, and more often than not this method is favoured by wholesalers. The disadvantages of the method to both parties, however, are numerous and it is suggested that the following important factors shall not be overlooked:—

(1) The manufacturer's representative can waste a considerable amount of time in ineffective selling by making numerous unproductive calls on customers who are not likely to be prospects. Even if the customer is a prospect much valuable time is wasted, particularly with large industrial firms, in getting into touch with the right man.

(2) The wholesaler knows his own prospects well and so arranges his salesmen's routes that as many calls as possible can be made with the minimum of travelling expense. The manufacturer's representative cannot hope to be conversant with all the prospective customers in a particular area, therefore needless expense is entailed in finding possible clients and in revisiting territory to call upon prospects missed on previous visits.

(3) Association with the wholesaler's salesmen creates valuable friendships and each can do much to benefit the other.

(4) When not accompanied by the wholesaler's salesman, but soliciting business on the wholesaler's behalf, the manufacturer's representative is looked upon as merely a temporary addition to a wholesaler's sales force and, in consequence, becomes just another salesman.

(5) Through his representative, the manufacturer can get a good hearing for his product from many possible users who have not been sufficiently educated by the wholesaler on the advantages and economies of buying through the wholesaler in preference to direct buying. As soon as the representative mentions that supplies are available from a local distributor the buyer makes known his preference for direct dealing with the manufacturer and then follows a long argument on the failings of wholesalers and the stating of his prejudices against them. Valuable time, which should be taken up in selling, is used up by the manufacturer's representative in upholding—quite unnecessarily—his firm's wholesaler policy. He may decide to accept a direct order at a price which protects the local wholesaler, but it will not be profitable to his employer and will cause friction with the wholesaler.

In repeating that closer co-operation and more frequent meetings of manufacturers and their wholesale distributors are necessary, it is suggested that both have still much to learn from each other before they achieve that efficient co-ordination of effort which is necessary if both are to enjoy the utmost benefits from their endeavours.

Fire in Unattended Buildings

THE danger arising from outbreaks of fire in unattended buildings is stressed in an urgent warning issued by the Ministry of Home Security. It is pointed out that if an outbreak occurs in such a building the fire may not only involve a serious call upon the local fire services through not having been detected at an early stage, but may also serve as a beacon to raiding aircraft. Even a single person in the building could at least summon the fire brigade at once, even if he cannot extinguish the fire before it has got hold.

The main classes of premises to be cotnsidered are factory and warehouse buildings, and timber yards. Occupiers of all such premises are strongly urged to secure that at least one person is always on the premises for the purposes of giving an alarm in case of fire and also to provide simple fire-fighting equipment for use until the fire brigade arrives, if they have not already done so.

COMMERCIAL and INDUSTRIAL NEWS

Trade With New Zealand. Factory Lighting Conference. New Aluminium Alloy Organisation

New Zealand and British Imports

REFERRING to the efforts being made here to expand export trade the *New Zealand Electrical Journal* says that New Zealand is beginning to feel the first "ripples" which the great wind of reorganisation has raised in the Old Country. Our contemporary goes on to say:—

"In New Zealand, however, we do not seem as yet to have realised that such reorganisation by our suppliers needs a contemporary and simultaneous reorganisation here, especially in view of the fact that the country's imports of electrical apparatus are so strictly controlled under both Import and Industrial Efficiency Bureau Regulations. Already there are not lacking instances where, after an examination in Great Britain of raw material supplies, electrical articles and equipment have been licensed for export and raw materials supplied to manufacturers for this purpose, whereas in New Zealand such products have been placed on the prohibited list and therefore are not acceptable here. The reverse, of course, is also true where products unobtainable in England through lack of raw materials to make them have theoretical quotas in New Zealand—which quotas it is becoming increasingly difficult to fill and will be, in the near future, impossible to satisfy. There seems some need for co-ordinated effort here, and some method of collaboration between those in New Zealand who understand the nature and extent of our electrical industry with those in England who understand the nature and extent of the services Great Britain can offer to us.

"It is not a matter which can stand over for too long unless we are willing to admit that the N.Z. electrical industry is apathetic to the possible effects of a sectional breakdown in the process of exporting, to which Great Britain attaches such tremendous importance and upon which she depends for currency to provide food and the munitions of war."

Wartime Factory Lighting

A conference attended by over 250 lighting engineers and lighting specialists was held recently at the Lighting Service Bureau of the E.L.M.A., the chair being taken by Mr. J. Y. Fletcher. The object of the conference was to discuss ways and means of giving maximum assistance to factory executives in providing adequate illumination conforming to the requirements of the Ministry of Supply, also to consider the best way in which the electrical industry can help the thousands of factories that will need to revise their existing installations in the event of the recommendations of the Departmental Committee on Factory Lighting becoming mandatory.

The electrical industry has already set up a Joint Lighting Committee with members representing the following Associations:—E.D.A., E.C.A., I.M.E.A., C.M.A., Incorporated Association of Electric Power Companies, Electric Light Fittings Association, and E.L.M.A. Sir Duncan Wilson acts as chairman of this Committee, and Mr. W. J. Jones as secretary, the secretariat being vested in the E.L.M.A. Lighting Service Bureau. It was pointed out that the Minister could require "vital" factories to provide lighting up to the standards of the Illuminating Engineering Society's Code of Recommended Illumination Values, with due regard to the provisions of the Factories Act. This step has been taken with the object of obtaining maximum sustained production, and factories complying with the order will receive financial aid.

The technical representatives of the Joint Lighting Committee have produced a memorandum designed to ensure reasonable uniformity as to the basis of any lighting recommendations that member firms of the Associations concerned may present in this connection, thereby saving a certain amount of time and duplication of effort; but it is pointed out that it is in no way intended to limit the exercise of discretion in special circumstances, or to act as a substitute for normal illumination design procedure. This memorandum was distributed to those attending the conference. Sir Duncan referred to the Fifth Report of the Departmental Committee on Factory Lighting, and the possibility of the recommendations contained therein being made mandatory. These include the following:—(1) Over the interior parts in which persons are regularly employed the illumination shall not be less than 6 ft.-candles, without prejudice to any additional illumination required by the nature of the work. Provided that in parts of factories where persons are employed, in which the mounting height of the light sources necessarily exceeds 25 ft. measured from the floor, or where the structure of the room prevents the uniform provision of this standard, the illumination shall not be less than 2 ft.-candles, and not less than 6 ft.-candles where actual work is being done, without prejudice to any additional illumination required by the nature of the work. The illumination shall be measured in the horizontal plane at a level of 3 ft. from the floor. (2) Over all interior parts over which persons employed are liable to pass other than those in which persons are regularly employed, the illumination at floor level shall not be less than 0.5 ft.-candles. It was pointed out that the wording of these clauses indicates clearly that the minimum of 6 ft.-candles must not be taken as sufficient for process working, but is intended rather as setting a minimum standard for comfort or amenity.

Lighting engineers should therefore recommend illumination values in accordance with the I.E.S. Code, subject to a minimum of 6 ft.-candles.

Demonstrations of illumination levels from ½ up to over 50 ft.-candles were given with the permanently installed systems of tungsten, mercury, fluorescent mercury, sodium, and tubular fluorescent lighting in the lecture room of the Bureau; and members of the electrical industry were urged to bring their customers for information and for practical demonstrations of lighting values, fittings, and all matters concerning illumination.

Barrage Balloon Deaths

Two men, Messrs. H. Bolden and T. Jeffery, were killed at a place in Mid-Sussex recently when they were endeavouring to secure a barrage balloon which had broken away from its moorings. The *Sussex Daily News*, reporting the inquest states that the evidence showed that the cable of the balloon became entangled with an 11-kV overhead line and upon grasping the cable the two men received a fatal shock. The Coroner, who recorded a verdict of "Accidental death," said that in trying to secure the balloon the men were performing a public duty and a compassionate allowance should be granted to their dependants.

Light Aluminium Alloys

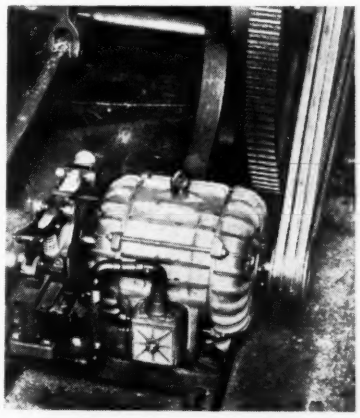
With a view to extending the uses of wrought light aluminium alloys, leading manufacturers have applied to the Board of Trade to form a new trade organisation, to be known as the Wrought Light Alloys Development Association. Among the stated objects are:—(a) To promote with a view to increasing the consumption of wrought light aluminium alloys, co-operation between persons, firms and companies who carry on business as miners, smelters, producers or refiners of or dealers in the constituent materials; (b) To keep in touch with progress and developments in any field which may directly or indirectly affect or tend to affect the consumption of such light aluminium alloys; and (c) To promote the production, treatment and consumption of the alloys by the collection, collation, dissemination and publication of information relating to them.

Electrical Housecraft for Boys

The boys in Bembrose Secondary School, Derby, have created a precedent by taking a course in electrical housecraft during their holiday vacation. More than twenty boys aged between 11 and 14 attended eight lectures, arranged by the Electrical Association for Women, demonstrating the use of electrical appliances in the home, the most popular lectures being those on the electric cooker and refrigerator. Every boy cooked either pancakes, sausage and mash, egg on chips, milk pudding, &c. The whole course was such a success that the masters are convinced that it is important that boys as well as girls should learn to cook, and it is hoped that a course of six lectures may be arranged in the boys' school as part of the curriculum. This course is the first of its kind that has ever been run in the country.

Motorising a Guillotine Drive

In the accompanying picture we show a hand-driven guillotine, the output of which was required to be considerably increased due to national demand. An intermittently - rated, totally - enclosed motor was designed by Brook Motors, Ltd., capable of 600 per cent. torque at starting and the drive taken from a "V" pulley direct on to the flywheel rim of the machine. The motor was fitted with a double-ended shaft and mounted on a common bedplate with



A hand-driven guillotine converted to electric drive

an Igranic magnetic brake. A balanced hand guard was fitted to the machine, interlocked electrically with the contactor controlling the motor. Finally a limit switch was operated from the top of the moving guillotine blade.

In operation, pressing the start-button allows the blade to make one stroke, and owing to the action of the limit switch, always stops at the top of the stroke. Any attempt to lift the guard immediately applies the brake, and control is so accurate that the blade movement after the brake is applied is only one eighth of an inch.

Spitfire Funds

The employees of British Insulated Cables, Ltd., have decided to provide a "Spitfire." The company has assisted in this venture by subscribing to the fund an amount equal to the total subscribed by the employees. A cheque for £5,000 has, accordingly, been sent to the Minister for Aircraft Production.

Henley's staff, at head office, works and branches at home and overseas are subscribing for the purchase of a "Spitfire." Members of the staff are contributing an individually decided weekly amount for a period of six weeks, or a lump sum, all the directors are subscribing, and Sir Montague Hughman has promised to add 10 per cent. of whatever amount up to £5,000 is subscribed. In addition to the weekly collections, sweepstakes are being run at head office and the works, and at head office various sideshows are being staged to swell the fund.

The Spitfire fund started a few weeks

ago by employees of the G.E.C. to raise £5,000 quickly passed the original aim, and early this week had reached the figure of £7,362. A cheque for this amount has been handed to the Minister of Aircraft Production by four employees from different branches of the company, two of whom have had over fifty-six years' service with the company. Lord Beaverbrook, in expressing his gratitude for the gift, recalled that Captain Leslie Gamage, M.C., and another of the directors had already given £5,000 each.

An Electrician's Notice

A case at Bolton, on September 11th, revealed a rule of the Electrical Trades Union, that an employee could terminate, or have terminated, his employment after an hour's notice. A claim for £10 was made by E. P. Potter and Co., Little Lever, against William E. Ratcliffe, Lupin Avenue, Farnworth. It was contended that defendant was a maintenance electrician and that his terms of service were that a week's notice should be given by either party. It was stated that when defendant said he was "fed up" and was leaving he was remonstrated with but he handed over his keys and left. Counsel said the firm was engaged on work of national importance. Defendant had been with the firm since 1922, and his wages were £4 13s. per week.

Defendant contended that the terms of employment were an hour's notice on either side, and he gave that notice. Quoting from Rule 9 of the Working Rules of the Electrical Trades Union, his solicitor read: "Should an employer require to discharge, or a workman desire to leave his employment, one hour's notice shall be given on either side, or one hour's pay in lieu of such notice." There were 50,000 to 60,000 electricians working on that rule, he said. The Bench found that defendant should have given a week's notice and allowed the claim.

Canadian Refrigerator Sales

Sales of electric household refrigerators in Canada for the first half of 1940, according to returns compiled by the National Electrical Manufacturers' Association, totalled 41,257 units. This compares with 33,114 units for the corresponding period last year. Monthly sales for the current year have been consistently ahead of those for the like periods of 1939. During June 8,109 refrigerators were sold, as against 5,979 units for June last year.

Irish Smuggling Case

At Letterkenny (Co. Donegal) recently Thomas J. Stockman, a manufacturers' agent, Belfast, was charged with knowingly harbouring prohibited goods at an address in Dublin. The goods in question were a quantity of filament lamps and sparking plugs. Counsel for the Revenue Commissioners said that he was proceeding for a penalty of £518 14s., three times the duty-paid value of the goods. A Customs official, giving evidence, said that he discovered the goods, which were marked "Made in England," and some time later interrogated the defendant, who made a statement. He denied that the statement had been obtained under duress. The judge considered, however, that Stockman had been tricked into going within jurisdiction and had been subjected to "mild third degree" methods.

A witness said that he had agreed to buy the lamps and plugs fully aware that they had been smuggled into the country. Stockman denied that he had crossed the border and picked up the goods from another man who had crossed by an unapproved road.

The judge said that he could not accept the submissions for the defence and imposed the fine asked for by the Revenue Commissioners.

Lighting Restrictions

We regret that an error crept into the article on the above subject by Mr. J. F. Stanley (B.S.I.) in our issue of September 6th. It was stated (p. 196) that "the 'unit of effective brightness' was chosen to equal one-hundredth of one equivalent ft.-candle . . ." This should have been one-thousandth, as stated in the preceding paragraph.

Printing Works Drive

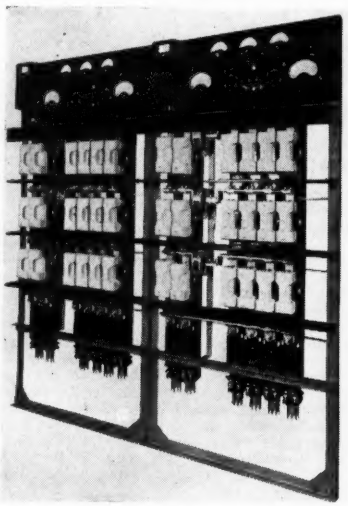
Messrs. Ellis & Ward, Ltd., inform us that they carried out the whole of the installation at the works of James Cond. Ltd., Birmingham, which we described in our issue of August 30th. The work was carried out under somewhat difficult conditions in view of the removal of the machinery from the old works and its re-erection in the new with the minimum of delay. In many cases the machines were removed and reinstalled on the same day.

Marine Engineers' Examinations

Examinations for admission to associate membership and graduateship of the Institute of Marine Engineers will be held on May 19th to 26th, 1941. The Institute's examination for admission of students is discontinued, the Council having adopted in lieu the Common Preliminary Examination of the Engineering Joint Examination Board. Two of these examinations will be held in 1941, on April 1st-5th, and on October 7th-11th. Particulars can be obtained from the secretary of the Institute, 73, Amersham Road, High Wycombe, Bucks.

Unit Panels for Overseas

The accompanying illustration shows two panels out of a set of five similar panels which form part of a considerable amount of Henley electrical distribution equipment being shipped overseas on behalf of the Crown Agents for the Colonies. It will be seen that each panel consists of six tailless box-type units. These are of 300-A capacity and accommodate four-core cables. The feeder units are fitted with quick-break links in porcelain handles on the phases in place of the rewirable fuses or



Two Henley unit panels for shipment overseas

h.r.c. cartridge fuses sometimes provided.

The sets of units are mounted on a mild-steel framework, on top of which is a meter panel, which includes a three-phase four-wire integrating watt-hour meter (the current transformers being on the bus-bars), three thermal type half-hour ammeters with 6-in. dials reading 0-600, ammeter switch, voltmeter with 6-in. dial reading 0-300, complete with three-way and off voltmeter switch and protective fuses. The panels are suitable for wall and floor fixing and are complete with necessary bus-bars and small wiring for instruments.

With panels of this type provision can be made for extra units to be added later, and this is being done in the case of one of the panels included in the present consignment. The unique arrangement of sliding bus-bar clamping plates facilitates the introduction of additional units or the changing over of units if necessary. If an additional fuse for a small lighting core is required with a box type unit it can be fitted on the front of the unit below the neutral bus-bar.

Emergency Light for Explosive Atmospheres

The Home Office has recently granted a certificate for G.E.C. "Life-Lights" and "Emergency Lights." This signifies approval, after tests, of these special electric torches in situations where an explosive petroleum atmosphere may exist, such as in oil tankers, or in the workshops of the petroleum and cellulose industries. The construction of the "Life-Light" ensures that oil or spirit floating on the surface of the water in the event of an accident shall not aaffect its efficiency, or constitute a danger.

The Home Office approval is of particular interest in relation to the "Emergency Light." This can be used in appropriate places on tankers either as a fixed emergency light or as a portable hand lamp. When fixed in alleyways, wheelhouse, engine room or other places where light is necessary it can be used to advantage in place of more costly emergency lighting systems.

The features of the "Emergency Light" are:—(1) 30 hours' continual burning life, allowing many intermittent periods of use, before replacing batteries. (2) Armour glass and robust general construction. (3) Foolproof automatic gravity switch, ensuring definite operation whenever required. (4) Spring plunger, preventing the bulb screwing back and the light going off. (5) Compactly mounted. (6) Simply operated—by inverting in bracket.

Scottish Reconstruction Panels

Five Local Reconstruction Panels have been set up in Scotland to organise in advance the resources of all important engineering establishments in their respective districts for the mutual assistance of any works which have been damaged by enemy action, and to assist in restoring production with the minimum of delay. These panels, which consist of a number of industrial representatives acting in a voluntary capacity, were organised by the Ministry of Aircraft Production. Their services are available to all firms working for the Admiralty, the Ministry of Aircraft Production, and the Ministry of Supply. Present membership of the various panels include:—Edinburgh, Lothians and Borders: Mr. W. Wallace (Brown Bros. & Co., Ltd.), (Chairman); Mr. A. Johnston (North British Rubber Co., Ltd.), and Mr. G. L. Kirkpatrick (Bruce Peebles & Co., Ltd.). Aberdeen and North-East Scotland: Mr. A. Wilson (Alex. Wilson, Ltd.), (Chairman); Mr. S. Hunter Gordon (Rose Street Foundry and Engineering Co., Ltd.), and Mr. J. U. Vass (Consolidated Pneumatic Tool Co., Ltd.). Dundee and Angus: Mr. J. J. Barrie (Jas. F. Low & Co., Ltd.), (Chairman). Kirkcaldy (Fife): Mr. W. Ayre (Burntisland Shipbuilding Co., Ltd.), (Chairman). Glasgow and West of Scotland: Mr. J. B. Mavor (Mavor & Coulson, Ltd.), (Chairman); Mr. E. Bruce Ball, jun. (Glenfield & Kennedy, Ltd.); Mr. J. G. Bullen (North British Aluminium Co., Ltd.), and Mr. G. W. Wortley (R. and A. Main, Ltd.).

Trade Announcements

The Ruberoid Co., Ltd., has removed to Sentinel House, 46, Southampton Row, London, W. C.1.

The Birmingham office of Laurence, Scott & Electromotors, Ltd., has been removed to Mere Green Chambers, Four Oaks, near Birmingham (telephone: Four Oaks 404).

From September 30th the temporary head office address of the British Aluminium Co., Ltd., will be Oakley Manor, Belle Vue Road, Shrewsbury, Shropshire (telephone Shrewsbury 4451. Telegrams: Cryolite Shrewsbury).

The head office of the Telegraph Construction & Maintenance Co., Ltd., and Submarine Cables, Ltd., is now at "Beechwood," Beech Road, Reigate, Surrey (telephone: Reigate 2267).

New Catalogues and Lists

Metropolitan-Vickers Electrical Co., Ltd., 1, Kingsway, London, W.C.2.—A priced folder of "Cosmos" lamps.

Silentbloc, Ltd., Victoria Gardens, Ladbroke Road, Notting Hill Gate, London, W. 11. — A booklet describing anti-vibration mountings designed for special applications, particularly when dimensional restrictions arise.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

TEMPLETON cooker.

SWITCHGEAR FACTORY EXTENSIONS

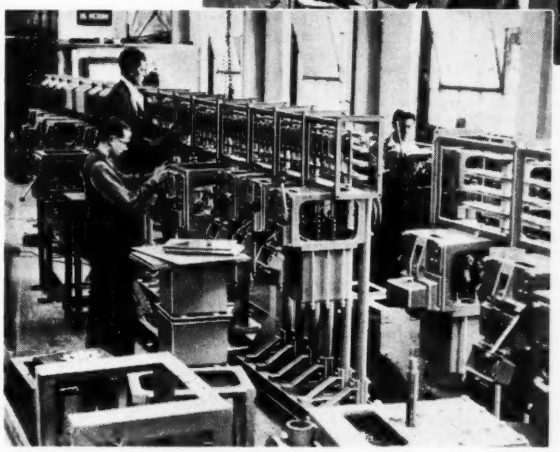
New Types of Circuit-breakers Being Produced

RECENT extensions to the factory of J. G. Statter & Co., Ltd., have added substantially to its capacity for the production of switchgear of all descriptions. The erection of an entirely new building for the assembly of oil circuit-breakers, besides relieving the old assembly department, has permitted a general expansion of the machine shops and the air-break circuit-breaker assembly department. There are also new stores for castings awaiting painting, a new paint shop, finished material stores and despatch department, whilst another extension is a well-equipped foundry which is already proving of great value in producing all the non-ferrous castings required. This section in particular is helping considerably to accelerate production and sufficient spare capacity is available to enable the company to undertake the supply of non-ferrous castings to other manufacturers.

With the provision of the extensions the opportunity has been taken to install a great deal of up-to-date equipment, including large guillotines, bending and nibbling machines, welding plant and a large impregnating plant. The provision of the bending machines enables the manufacture of instrument panels to be undertaken, largely on mass production lines, and the sheet steel cases thus formed, although exceedingly strong, are quite light and have the additional advantage especially important at present of saving a considerable amount of metal compared with the panels previously produced. Much time is also being saved by pressing out holes instead of drilling them. The nibbling machines are employed to cut holes in the thinner sheets of metal only, the thicker sheets being handled by oxy-acetylene cutters. So much welding is now done that men are employed solely for setting up in preparation for the actual welding. This practice, Major Marston, one of the joint managing directors, tells us, not only results in a better job but enables less highly skilled men to be utilised for the setting up processes than those engaged in welding, besides, of course, ensuring that the welding machines are continuously employed at maximum output.

The increase in production has naturally much increased the work of the testing department and this too has been enlarged and new equipment added, including a Westinghouse rectifier.

Among the interesting switchgear orders passing through the factory when we visited it a few days ago was one for a 21-panel metal-clad oil and compound-filled duplicate bus-bar vertical draw-out switchboard, 250 MVA rupturing capacity at 6.6 kV destined for Port Elizabeth. These equipments are solenoid operated with off-load bus selection and have potential transformers of the plug-in type at ground level. Another switchboard which we saw, comprising thirteen panels of the metal-clad oil and compound-filled single bus-bar vertical draw-out type, was one of four similar switchboards required by a chemical company.



Guillotine and bending machines, some of the new machinery installed at J. G. Statter & Co.'s factory, with (left) a corner of the new assembly block showing "M" type circuit-breakers in course of manufacture

Large numbers of the recently introduced type "VTGR" metal-clad air-insulated drop-down draw-out equipments for use on systems up to 11 kV were in various stages of construction. This gear is made in 150 and 250 MVA ratings and can either be arranged for manual, solenoid or spring operation and has a plug-in potential transformer fitted at the top of the unit. We were also able to see several switchboards built up of the company's type "M" gear which has proved popular for general industrial purposes. This gear comprises non-draw-out oil-immersed circuit-breakers for use on low-voltage AC systems and can be supplied with or without bus-bar isolators and has the cable boxes fitted either at the side or the back. This gear is made in all standard capacities up to 1,200 A.

Another of the company's products now being made in large quantities is the wide range of knife switches which are available in capacities from 30 to 5,000 A. A complete range of current transformers is also made for various supply undertakings in addition to those used in the company's own complete switchgear equipments. It is not possible to mention all the various types of switchgear manufactured, but a comprehensive range of gear is manufactured up to 12,000 A DC and 22 kV, 350 MVA rupturing capacity.

Carbon-steel Arc Furnaces

MODERN top-charge rapid type electric furnaces are in competition with open-hearth furnaces for producing ordinary quality steels, Mr. W. E. Moore states in a paper presented before the Electrotechnical Society at Warnerville, Pa. Twelve companies in the United States now roll carbon steel ingots produced entirely from the former.

Improvements in quality of electrode material and joint fitting and finishing have greatly helped the development of the arc furnace. Graphite electrodes are now available with diameters up to 20 in. and carbon electrodes are made up to 40 in. and even up to 3 metres when the Soderburg self-baking process is employed. This process consists of constructing a continuous electrode within a sheet-metal casing built section on section. Such electrodes permit the use of cheaper carbon and are often economical for large melting furnaces, particularly ferro-alloy and carbide, though the first cost of installation is high. They are not, the author considers, very suitable for steel furnaces of the tilting type.

Carbon blocks are obtainable to-day for use as refractories and linings at prices that are competitive, having regard to their favourable characteristics. Improvements have been made in silica blocks in accuracy of shape and freedom from spalling and also in high-alumina bricks for smaller furnaces or those operated on an occasional heat basis. Mullite rammed mixtures, which are resistant to solubility in slag, are being used successfully in smaller furnaces. Linings can now be renewed by ordinary labour, often on a Saturday afternoon after taking off the morning heat and cooling down with a hose.

Advantages of the newest form of top-charge furnace are that construction costs are lower than with the side-door machine-charging type and that the roof can be swung aside, permitting an entire charge to be dropped into the furnace at one operation. Its entire cubic capacity is available for scrap, whereas with the side-door charging type, the loading was often limited to one half by the door level in the side of the furnace. This type of furnace also permits rapid charging with scrap that is bulky in proportion to weight as it has a tendency to be in modern works. With early furnaces the average weight of scrap was 135 to 150 lb. per cu. ft., whereas to-day in many plants it is only from 35 to 50 lb. per cu. ft.

Data obtained in practice with the swing-aside-roof furnace are given by the author. A 12-ton, 7,500-kVA furnace having a daily production of 198 gross tons of good basic ingots required 680 kWh per ton. The total heat cycle was two hours and the load factor 64 per cent. It is anticipated that these results will be bettered with detailed improvements in operation and that there will be a growing demand for arc furnaces for non-ferrous industries as well as for steel melting.

ELECTRICITY SUPPLY

Modified Lighting Discussions. Canadian Power Schemes

Aldeburgh.—CHARGES FOR COUNCIL SUPPLY.—Contending that the Aldeburgh Electric Supply Co. had not justified the proposal the Council recently decided that it could not accede to an application for an increase in the contract charges for the supply to the Corporation of 5 per cent. for the June quarter and 20 per cent. thereafter.

Birkenhead. — RAILWAY PLANT EXTENSION.—The Electricity Committee is to extend plant for the Mersey Railway at a cost of £1,235.

Bradford.—PROPOSED NEW PLANT.—The Electricity Committee is to provide a new substation at a cost of £3,497, and is seeking sanction to borrow £7,897 for modification of switchgear. Land has been obtained for the erection of a switch-house.

Burton-on-Trent. — PROPOSED SUBSTATIONS.—The Electricity Committee has obtained two premises for substations.

Chesterfield. — LIGHTING DISCONTINUED.—At a meeting of the Emergency Committee last week it was decided not to re-introduce modified street lighting for the present, as apparently members are not satisfied that the lighting cannot be seen by hostile aircraft. During last winter the Town Council authorised the equipment of about 12½ miles of roads with low-intensity lamps, some being put into use.

Erith.—TARIFF REVISION.—The Electricity Committee has asked the electrical engineer to prepare proposals for a general revision of tariffs.

Hove.—SUBSTATION INTERCONNECTION.—The Electricity Committee is to interconnect substations at a cost of £574.

Isle of Man.—BULK SUPPLY ACTION.—The *Isle of Man Times* reports that after an all-day legal argument, following evidence spread over several days, Deemster Farrant last week reserved judgment in the Chancery Division action brought by the Isle of Man Electricity Board in connection with the charges made by the Douglas Corporation for the bulk supply to the Board.

Macclesfield. — PRICE PROSPECTS. — Since the electricity undertaking was transferred to the Council, it has yielded a net profit of £1,173. Councillor J. R. Atkins, chairman of the Electricity Committee, states that, whereas in most parts of the country there has been an increase in the charges for electricity, they hoped in Macclesfield, with economy, to keep the price as at present.

Middlesbrough. — MODIFIED LIGHTING UNDER CONSIDERATION.—The Corporation is considering the introduction of modified street lighting. Last winter the plan was discussed but not pursued.

Newcastle-on-Tyne.—STREET LIGHTING POSSIBILITIES.—Although the Minister for Home Security recently said in the House of Commons that it was not possible to allow modified street lighting in the Tyneside area, there are still hopes that some sort of lighting will be permitted. A conference of Tyneside local authorities passed a resolution a few weeks ago urging that street lighting be allowed, and Ald. D. Adams, M.P., who attended the conference, has received a letter in reply from the Minister for Home Security in which he says that, while it was not possible at present to allow street lighting in the coastal areas, the matter will be kept under review and there will be no delay in extending the area where lighting is allowed as soon as circumstances permit. Alderman Adams states that, following Mr. Churchill's hint of a "brighter blackout," he still believes Tyneside will be allowed street lighting.

Northern Ireland.—LIGHTING PLANS.—Extension of the system of low-intensity street lighting is being planned by the Police Committee, which proposes that 684 electric lamps and about 1,000 gas lamps shall be adapted.

Portsmouth. — ALTERATION OF C.E.B. VOLTAGE.—A letter has been received from the Central Electricity Board setting out the arrangements proposed for the change of voltage of the Board's connection, namely: The Board to change the voltage of its connection and the metering arrangements from 6.6 to 33 kV; the Corporation to provide a new switch house free of cost to the Board; the Corporation to provide sufficient transformer capacity; and the Corporation to take over from the Board certain specified equipment at the written down value at December 31st, 1939, and the new 6.6-kV earthing equipment at the ascertained cost.

Sale.—UNDERTAKING'S ACCOUNTS.—The accounts of the Electricity Department for the past year show a net profit of £10,298 against £14,010 in the previous year, but, after appropriating £9,566 for capital expenditure, there was a surplus of only £726 as compared with £4,611 in 1938-39. There was a reduction in the year's revenue from £83,333 to £77,491, working expenses decreasing by a smaller amount (from £61,039 to £58,096). The average price received per kWh sold declined further from 1.378d. to 1.339d., due to the transfer of more consumers from the flat rate to the two-part tariff. Total sales for the year were 11.7 million kWh compared with 11.5 million kWh in the previous year, the number of consumers rising by 511 to 11,999.

Scarborough.—LAND FOR SUBSTATION EXTENSION. — The Town Council is negotiating with Filey Urban District Council for land for the purpose of extending the U.D.C. substation. The extension is necessary owing to an increased demand for energy from the Buckrose Light and Power Co., Ltd.

Overseas

Canada.—PROPOSED NEW POWER PLANT.—Our Montreal Correspondent reports that construction of a new power plant on the Musquash River, Georgian Bay district, to cost between $1,000,000 and $1,500,000, is being considered by the Ontario Hydro-electric Power Commission. Plans and estimates are being prepared and municipalities concerned are being consulted on the proposal.

Work on the great engineering development of the St. Maurice Power Corporation at La Tuque, Quebec, has continued to progress very rapidly, and indications are that this, the largest project in the Dominion, which will bring into production 162,000 HP of power plant during the present year, will be completed well ahead of scheduled time. In announcing the completion of the dam which holds back the waters of the St. Maurice River at the power site, marking an important stage in the development, Mr. J. Wilson, president of the St. Maurice Power Corporation, comments that it is of the most vital importance that this great power development shall be available when it will be most essential to the production of war material. With the dam now completed, the by-pass channel, which up to the present time has carried the total flow of the river, has been closed by means of special gates and the waters now find their outlet through the sluice gates of the dam. During the spring and early summer the power house structure was finished. Four turbines are now installed and rapid progress is being made towards the completion of two generators. The engineering work on this project has been carried out by the Shawinigan Engineering Co. Its magnitude is indicated by the fact that the concrete dam intake structure, built across the St. Maurice River at the foot of La Tuque falls, is 100 ft. high and nearly a quarter of a mile long.

INCREASED OUTPUT IN QUEBEC.—For the first five months of 1940 the production of electric power by 29 principal distributors in Quebec Province amounted to 6,515 million kWh, an increase of 397.9 million kWh over the same period in 1939. Total sales for the period under review were 6,274.5 million kWh, an increase of 7.2 per cent. Primary sales in Quebec were 3,205.3 million kWh, compared with 2,655.1 million kWh, and primary export sales were 626.5 million kWh (1,461.5 million kWh). By class of service, sales are reported as follows (in million kWh) with 1939 figures in brackets: Domestic, 125.0 (120.0); commercial, 121.9 (111.8); industrial 2,810.1 (2,288.0); municipal power and street lighting, 60.4 (59.0); transportation, 70.0 (70.5); wholesale to municipalities, 17.9 (15.8).

Western Australia. — EXPANSION IN ELECTRICITY SALES.—The report of the Western Australian Government Electricity Supply Department for the year ended June 30th last records an increase in the quantity of electricity sold from 108.6 million kWh in 1937-8, to 117.1 million kWh last year, an improvement of 7.8 per cent. The principal consumer was the City of Perth Electricity and Gas Department, which took 72.4 million kWh. Commissioning of the new "B" station resulted in an increase in the plant capacity from 32,000 kW to 57,000 kW, and the maximum load rose from 29,500 kW to 33,000 kW. Fuel used amounted to 168,722 tons of coal, of which 165,355 tons was Collie (locally mined) coal. There was a reduction in the fuel used per kWh generated from 3.11 lb. to 2.77 lb., no doubt due to the greater efficiency of the new plant. The cost per kWh sold was slightly more than in the previous year—0.80d. against 0.79d. —while the average selling price decreased from 0.856d. to 0.847d.

TRANSPORT

Argentina. — ADOPTION OF TROLLEY-BUSES URGED.—From time to time during recent months the conversion of the tramway system in Buenos Aires to trolley-bus operation has been urged, the latest advocate being the local association known as "Los Amigos de la Ciudad," which suggests that trolley-buses should be substituted for trams in the centre of the city. Commenting on this plan the *Review of the River Plate* contends that trolley-buses should also be used in the outer areas, pointing out that on wide and open stretches of roadway the trolley-bus is capable of a speed in every way comparable with that of the motor-bus and, moreover, under conditions of greater comfort to passengers on account of the absence of noise, fumes and vibration.

Bradford.—HIRE OF TROLLEY-BUSES.—The Transport Committee has accepted an offer from the Southend Corporation Transport Committee to hire to the Bradford undertaking six double-deck trolley-buses at £20 per vehicle per month.

RADIO AND TELEPHONY

Aden.—NEW BROADCASTING STATION.—*The Times* reports that a new wireless station broadcasting in Arabic, French, Italian and Somali was declared open on Tuesday by the Acting Governor, Mr. W. H. Ingrams.

India.—NEW RADIO RECEIVING CENTRE.—A new receiving centre of All-India Radio has recently been opened about eight miles from Calcutta. Here information received from the Central News Organisation at New Delhi is relayed to the control room of the Calcutta transmitter for rebroadcasting. "Diamond"-type aerials have been erected, and two receivers are operated simultaneously to ensure continuity of service in the event of one failing.

Sweden. — TELEPHONY. — According to the Swedish International Press Bureau, Sweden occupies second place in the world, after the United States, in the number of telephones per head of the population. At the end of 1939 the country had 136 telephones per 1,000 persons, as compared with 127 in 1938, and the total number of instruments was 845,000. About 60,000 telephones were installed in 1939 as compared with 63,000 in 1938. Last year 171 new automatic telephone exchanges were brought into use, and 45 per cent. of all telephones are now automatic. The surplus income of the Swedish Telegraph Office—which also controls the telephone system—in 1939 increased by 2,900,000 kr. to 37,100,000 kr. (£2,180,000).

NEW BOOKS

Manuals for Boiler Operators. Power Station Chemistry. Radio Cyclopedia

Boiler Operator's Guide. By HARRY M. SPRING, jun. Pp. 353; figs. 242. McGraw-Hill Publishing Co., Ltd., Aldwych House, W.C.2. Price 20s.

Although dealing primarily with American practice, much of this handbook is of universal application, and its study will be profitable to all engaged on boiler-house duties who desire to increase their knowledge of the apparatus under their charge.

The first chapter describes the general construction of steam boilers and gives methods of stress calculations employing only simple arithmetic. Later, an account is given of various types of fire-tube and water-tube boilers, as well as a brief description of those of special design, such as the Loeffler, La Mont, Velox and Benson. There follow sections on boiler appliances and auxiliaries, boiler plant management, and problems of plant operation. Appendices contain matter relating to material for the manufacture of boilers, boiler scale, repair of boilers by riveted patches and a series of safety rules based upon accidents which have occurred.

A particularly useful chapter on problems of plant operation deals informatively with many important considerations, including scale formation and its removal, external and internal corrosion, embrittlement and factors causing cracking of boiler plates, priming difficulties and the effects of suspended and soluble impurities in the water. There are some helpful diagrams as well as useful hints on a variety of matters from welding to the fitting of gauge glasses. Very little reference is made to feed pumps, an omission which might be remedied in a future edition, as in the majority of boiler plants these auxiliaries are directly under the control of the boiler attendant, and their importance to the operation of the plant cannot be overestimated.

A feature of the book is a set of questions and answers at the end of each chapter relating to the descriptive matter contained in the latter. These are said to be typical of those in examinations for firemen's, engineers' and boiler inspectors' licences in various American States. The book is thoroughly practical and treatment of the subject is simple and straightforward. Production is excellent, but the price seems a little high for a work which is in no sense an advanced treatise.—W. H. S.

Hydraulic Measurements. By Herbert Addison. Pp. 301; figs. 142. Chapman and Hall, Ltd., 11, Henrietta Street, W.C.2. Price 21s.

The science of measurement comprises both the exact and the empirical. Any two competent electrical engineers, provided with the necessary measuring instruments, would necessarily agree within a small fraction of one per cent. Equally competent hydraulic engineers have to be content with empirical and often divergent approximations, and they often have strong prejudices in favour of particular methods and instruments and "flatly refuse to accept any measurements" made with other types by other engineers.

Uncertainty is inherent to the extent of at least ± 2 per cent. in some measures, while + 10 per cent. is often all that can be hoped for. This may be illustrated by mention of a world-famed specialist who timed the flow of the Nile with half a dozen beer bottles, floated over a length merely paced out, and timed by counting seconds without a stop-watch; the resulting discharge was close to the mean of a number of highly scientific but discordant determinations by others.

The rivalry between cup and propeller-type current meters strangely follows national and linguistic instead of personal lines, and is far from settled. In quantity gauging generally, the uncertainty is, apart from the personal equation, due to the oblique flow of water in irregular channels, turbulence, floating impurities and inexact construction of weirs, &c. Depth, head, weight, volume and pressure can usually be measured with fair accuracy, though there is always scope for error with the inexperienced subordinates to whom much of the detailed work must be handed over. Velocity measures are, however, inherently uncertain, and on them depends the calculation of discharge.

Four chapters of this useful book are devoted to methods of measuring discharges in closed conduits and three to the same in open channels, which are of more practical interest to the hydro-electric engineer. Electrical devices of various kinds find both direct and indirect applications in these measurements, and are fully dealt with by the author.

In obtaining synchronised readings at points some distance apart, and in remote control, the advantages of electricity are obvious. An ingenious "all-electric" method of flow measurement is described in paragraph 225. Salt titration methods employ electrodes at the collecting end, and the latest variation is explained: this appears to give fairly concordant results.

The electrical engineer can, however, seldom employ any but the roughest methods in the field, when making preliminary estimates of water power sites. Thus, in one instance, the reviewer was unable to assess a stream until it was found that it was joined by a cold glacier tributary; when by taking the temperature of the two branches and of the main stream the proportions of each were roughly gauged.

This book will be found particularly useful by "busy engineers whose assistants have little time for incessantly nursing the gauging equipment," a description which aptly describes most of us who have worked in lands less up-to-date than Egypt, where hydraulic science originated—except that we sometimes had no assistant.

It is, by the way, noticeable that nowhere in the book is the British Standard Specification for "Rating of Rivers for Power Purposes" (610 of 1935) mentioned; the fundamental basis of this has been accepted by the I.E.C. Another omission is Mr. Kennedy's classic silt theory, which "saved the Government of India vast sums of money" and was followed up in Egypt. The cumbrous "cubic foot per second" has, in most countries long given way to "cusec," which nowhere appears in the volume. These minor points are more than counterbalanced by lucid descriptions of apparatus and methods, accompanied at the end by a good glossary, conversion table and index.—J. W. M.

Boiler House and Power Station Chemistry. By Wilfrid Francis. Pp. 203; figs. 58. Edward Arnold & Co., 41, Maddox Street, W.1. Price 15s.

Efforts to achieve maximum availability of plant and other economies in operation have led to the extended employment of chemists in electricity undertakings. A book which deals clearly with power station chemistry as a whole is therefore welcome, and particularly so when it will also appeal to engineers. It is for their sake that the author has saved most of the purely chemical details for the second part.

The first part has a fitting introduction outlining the duties and responsibilities of the power station chemist. Then follows an interesting chapter on the constitution of pure coal, which should give a better appreciation of the selection of commercial varieties. The next two chapters get down to the practical side by describing the effects of moisture and mineral impurities. The section on ash fusion and its effect on clinker formation and "birdnesting" is informative. Fuller information might have been included on temperatures at which clinkering troubles commence.

An explanation of how efficiencies and heat balances are calculated is followed by a chapter on flue gas treatment, which is mainly descriptive, but is too brief to be of practical value. Scale formation, corrosion, caustic embrittlement, and "carry over" are clearly dealt with under raw and conditioned waters. A diagram of a modern "closed in" feed system might have been included, as its introduction has done more than anything else to combat corrosion troubles in power stations. A chapter on turbine and transformer oils shows an intimate knowledge, and contains sound advice.

Part II is essentially for the chemist, and gives laboratory methods for testing coal, oil and water. They are clearly set out and easily followed. The large field of power station chemistry is covered apart from the omission of metallurgy and refractories, but it is impossible to do so exhaustively in a book of only 200 pages. No doubt for this reason the author has ended each chapter with an excellent list of references.

The style is noteworthy for its lack of irrelevancy, and wisely a mere outline is given of subjects such as chlorination of polluted cooling waters, which are in their infancy. Experienced power station chemists may not find much new, but even so, many will welcome having the generally accepted views set down in such compact form. For young chemists entering power station laboratories, the book is excellent, and fills a gap.—A. B. O.

Drake's Cyclopedia of Radio and Electronics. By H. P. Manly and L. O. Gorder. Ninth edition. Pp. about 1,000; figs. about 1,200. Technical Press, Ltd., 5, Ave Maria Lane, Ludgate Hill, E.C.4. Price 30s.

This is an American publication by F. J. Drake and Co., of Chicago. It covers the field of radio, television, sound film, public address, photocells and other allied electronic subjects. A single alphabetical arrangement of all subjects has been chosen, with the result that the book is more suitable for providing reference data than for general instruction in a subject. However, with the help of a very extensive cross-reference system, which is included in the various articles, and also alphabetically, the reader can follow a subject in its various aspects to any extent desired. An elementary and non-technical treatment of the various subjects has been adopted, making the information suitable for those with little or no specialised knowledge.

Examining in detail some of the information included, one is forced to the conclusion that much of it must have formed part of the early additions of the work, and at the present time is more historical than practical. There is also internal evidence to show that whereas many up-to-date developments are included, any modifications or additions they may involve in earlier material have not necessarily been included. However, with reservations such as this, and bearing in mind that American terms and practice are used and described throughout, the book can still be recommended as containing a wealth of information on subjects in a very broad field.—W. E. M.

Shorter Notices

"Diesel Engines and Diesel Electric Power," by E. L. Richards. Pp. 308; illus. Price 10s. 6d. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2.

"Electrical Measurements in Principle and Practice," by H. Cobden Turner and E. H. W. Banner. (354 pp., 219 figs.) Price 17s. 6d. This is a cheaper edition of a work published in 1935. "Radio-frequency Measurements by Bridge and Resonance Methods." By L. Hartshorn. Pp. 265; figs. 99. Price 21s. Chapman & Hall, Ltd., 11, Henrietta Street, W.C.2.

"Electricity Applied to Marine Engineering." By W. Laws. Pp. 276; figs. 135. Institute of Marine Engineers, 73, Amersham Road, High Wycombe, Bucks. Price 5s. 6d.

"Small Motor Construction." By J. Gordon Hall. Pp. 66; 27 figs. Price 2s. "How to Prevent Electrical Troubles." By E. B. Watton. Pp. 104; 25 figs. Price 2s. 6d. Percival Marshall & Co., Ltd., 60, Kingsway, London, W.C.2.

FINANCIAL SECTION

New Companies. Capital Returns. Debenture Charges. Bankruptcies and Liquidations. Reports and Dividends. Stocks and Shares

New Companies Registered

Universal Engineering Co. (Southampton), Ltd.—Private company. Registered September 5th. Capital, £500. Objects: To carry on the business of mechanical, electrical, hydraulic, armaments and general engineers and contractors, &c. Directors: E. G. Heelas (managing director), Alta Vista, Empire Road, Salisbury, Wilts, and S. J. Clegg, 205, Shirley Road, Southampton. Secretary: M. P. Simmons. Registered office: 205, Shirley Road, Southampton.

Robt. Sanderson (Engineers), Ltd.—Private company. Registered September 7th. Capital, £2,000. Objects: To carry on the business of electrical, mechanical, marine, constructional, internal combustion and general engineers, manufacturers of and dealers in electrical switchgear, &c. Directors: R. Sanderson, E. Sanderson, and Mary Sanderson, all of 24, Trentham Avenue, Longbenton, Newcastle-on-Tyne; Wm. G. Sanderson, 55, Bolbec Road, Fenham, and R. Sanderson, 45, Thornton Drive, Denton, Newcastle-on-Tyne. Registered office: 17, Sandgate, Newcastle-on-Tyne.

Regent Engineering Co. (Hinckley), Ltd.—Private company. Registered September 9th. Capital, £250. Objects: To acquire the business of a mechanical and electrical engineer now carried on by Guy S. Ross at Regent Street, Hinckley, Leics. Subscribers: G. S. Ross, Denbigh Hotel, Lutterworth, Leics, and R. Cowlishaw, Rockingham House, Malvern Avenue, Rugby. G. S. Ross (managing director of Ross Motors, Ltd., and Essential Trade Securities, Ltd.), is chairman and managing director. Registered office: Regent Street, Hinckley, Leics.

Companies' Returns

Statements of Capital

Cuba Submarine Telegraph Co., Ltd.—Capital, £220,000 in 16,000 ordinary shares of £10 and 6,000 preference shares of £10 each. Return dated June 4th. All shares taken up. £220,000 paid. Mortgages and charges, nil.

"J.D." Insulating Co., Ltd.—Capital, £20,000 in £1 shares. Return dated February 27th, 1940 (registered May 9th). 4,200 shares taken up. £4,200 paid. Mortgages and charges: £3,000.

Electromobile Engineering Company (West Bromwich), Ltd.—Capital, £2,000 in £1 shares. Return dated December 31st, 1939 (filed May 4th, 1940). 482 shares taken up. £482 paid. Mortgages and charges, nil.

Starkie & Sparkes, Ltd.—Capital, £1,000 in £1 shares. Return dated June 3rd, 1940. All shares taken up. £1,000 paid. Mortgages and charges, nil.

China & Japan Telephone & Electric Co., Ltd.—Capital, £200,000 in £1 shares. Return dated June 4th. 150,000 shares taken up. £60,239 paid, £89,761 considered as paid. Mortgages and charges, nil.

Mortgages and Charges

Foxcroft and Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, fixed plant and machinery, dated August 23rd, 1940, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Patrick Adie, Ltd.—Issue on August 29th, 1940, of £500 debentures, part of a series already registered.

Mycalex (Parent) Co., Ltd.—Charge on freehold premises, No. 46, Ashcroft Road, Cirencester, with land adjoining, dated September 2nd, 1940, to secure sums not exceeding at any time £3,000. Holders: Coutts & Co., 440, Strand, London, W.C.2.

Wm. G. Walter (Bath), Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital (but excepting freehold property known as Stuart Works, Twerton, Bath), dated August 22nd, 1940, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Bankruptcy Proceedings

H. Beaumont, electrical engineer and radio dealer, 207, Luck Lane, Paddock, Huddersfield. — Receiving order made September 4th on debtor's own petition.

Reports and Dividends

The Shawinigan Water & Power Co. reports a gross revenue for the quarter to March 31st of $3,998,524, as compared with $3,654,733 for the corresponding period of 1939, and after deducting fixed charges, income tax, depreciation, &c., there is a surplus for the quarter of $657,981 (against $599,471).

A. Reyrolle and Co., Ltd., are again paying an interim dividend of 5 per cent.

British Ropes, Ltd., has declared an interim dividend of 5 per cent. on capital increased in April last by a share bonus of 100 per cent. No interim was paid in the previous year, but the total for 1939 was 25 per cent.

The British Thermostat Co., Ltd., is to maintain its interim dividend at 7½ per cent.

Imperial Chemical Industries, Ltd., is to pay an interim dividend of 3 per cent. (same) on their ordinary stock. Last year there was a final dividend of 5 per cent., making 8 per cent. for the year.

The British Aluminium Co., Ltd., proposes to pay an interim dividend of 3 per cent., as against 4 per cent. last year. The final rate for 1939 was 8½ per cent., making 12½ per cent. for the year.

The Electric Supply Corporation, Ltd., is to maintain its interim dividend at 3½ per cent.

The Scottish Power Co., Ltd., is maintaining its interim dividend at 2½ per cent.

The West London & Provincial Electric & General Trust, Ltd., is to pay an interim dividend of 2 per cent. (same).

The Lancashire United Transport & Power Co., Ltd., proposes to maintain its interim dividend at 4 per cent.

British Insulated Cables, Ltd., is maintaining its interim ordinary dividend at 5 per cent., less tax.

The Automatic Telephone & Electric Co., Ltd., has announced an interim dividend of 3 per cent. (same).

Richard Johnson, Clapham & Morris, Ltd., report a trading profit for the past year of £30,186, as compared with £15,689 for the preceding year. The final dividend is 11½ per cent., making 15 per cent. for the year (same), and a participating dividend of 1 per cent. is paid on the preference shares, making 7 per cent. (same). The balance carried forward is £5,594 (against £4,636 brought in).

The United Steel Companies are maintaining their dividend for the year at 8 per cent. by the final payment of 2½ per cent.

Venner Time Switches, Ltd., has decided to defer payment of the half-year's dividend due September 30th on the 8 per cent. cumulative preference shares until the results of the full year's working to December 31st have been ascertained.

Cable & Wireless, Ltd., announces an interim dividend at the rate of 1½ per cent. less tax, in respect of the year ending December 31st (same).

Cable & Wireless (Holding), Ltd., is paying a dividend on the preference stock of 2¾ per cent., less tax at 8s. 5d. for the half-year ended June 30th.

Australian Electrical News

STATISTICAL information with reference to transport and communication in Australia is contained in a bulletin issued recently by the Commonwealth Statistician. The following details given in the *Electrical Engineer and Merchandiser*, refer to electrically operated services:—

The cost of construction and equipment of the tramway undertakings is made up of £18,728,662 (Government owned), £7,677,387 (municipal) and £482,099 (private). Of the total amount £26,275,116 has been expended on electric tramways, £105,110 on steam or petrol equipment, and £507,922 on cable tramways. There are 586.14 route miles of electric tramway, 12.45 miles of steam or petrol tramway and 7.9 miles of cable tramway. Of these amounts the Government controls 414.36 route miles, municipalities, 179.23 miles, and private owners 12.9 miles. Of the total route mileage 491.73 are 4 ft. 8½ in. gauge. The following tramway statistics cover the year 1938-39, while those for 1937-38 are shown in parenthesis for comparative purposes: Route mileage, 586.14 (578.16); number of cars, motors and trailers,, 3,471 (3,438); seating capacity, 207,167 (206,400); car miles, 81,361,000 (81,038,000); number of passenger journeys, 695,476,000 (689,286,000); passengers per car mile, 8.55 (8.51); kWh generated for traction, 278,299,000; number of employees engaged 17,207.

The process of changing over the telephone network to automatic operation proceeds steadily. The percentage of automatic equipment in Australia has risen from 46.24 in 1937 to 50.95 in 1939, and the magneto system has dropped from 45.23 in 1937 to 42.36 in 1939. The balance of equipment is operated on the common battery system. The following are the more important figures for 1938-39 relating to telephone service (1937-38 in parenthesis):— Telephone exchanges, 6,333 (6,291); public telephones, 11,076; lines connected, 487,535 (465,498); instruments connected, 611,996 (630,175); instruments per 1,000 of population, 95.1; effective paid calls, 596,194,000 (558,643,000) earnings, £8,283,980; cost of construction during year (excluding trunk lines), £3,448,378 (£3,099,405).

Statistics given relating to radio communication for the two years are as follows:—Broadcasting stations: National 26 (24), licensed, 97 (93); broadcast listeners, 1,129,786 (1,055,995); other classes of licences, 2,715 (2,461); revenue collected, £1,181,347 (£1,104,512).

Inventory of Plant

The Secretary of the Electrical Manufacturers' Association of N.S.W. has in hand an inventory of plant and personnel of various members for the information of the Minister of Munitions, showing the details of equipment available for making war material. This inventory is now partially compiled and when complete will be forwarded to the Munitions Department.

According to the *Electrical and Radio Trader*, the manufacturers section of the electrical industry in New South Wales involves about 6,000 workers, the majority of whom are skilled in their trades. The greater number of these operatives are available at short notice for the production of aircraft parts and precision work for military ordnance and equipment material. Already about one-third of these workers are busily engaged in the production of war material; the remainder are being brought into line and will, it is expected, be engaged in similar work before long.

STOCKS AND SHARES

TUESDAY EVENING.

CONDITIONS being as they are, Stock Exchange business cannot be expected to escape the prevailing influences that exist in nearly every profession and trade. The constant interference of warnings is, it need hardly be said, a very present hindrance to any approach to freedom of dealings. Clients are too greatly concerned with the problems caused by aerial attack for them to pay normal attention to prices of stocks and shares. They, the clients, are keenly interested in the behaviour of prices and of markets in this present phase of the war, but the interest is more academic than practical. Orders are scanty: they are confined mostly to gilt-edged stocks. Changes in prices are therefore negligible. In the forty years over which the writing of this article extends, memory can recall no occasion in the 2,080 weeks when there have been so few alterations to record. But in regard to the outlook, the Mark Tapley of to-day will doubtless declare that the first ten years of the present air-raid invasion are likely to prove the worst.

With that habit of good-humoured adaptability which has often been illustrated during strike periods in the past, London has rearranged its business hours in order to fit in with the crisis of the moment. The Government has given an official lead by regarding a siren signal as a warning to be on the alert, rather than an indication that immediate peril is at hand.

Home Railway Factors

Talk of invasion, put into plain words by the Prime Minister, is largely responsible for the dullness of prices in the Home Railway market. In addition to what may be called the automatic process of realisation that takes place daily by order of executors, a certain amount of stock has come in for sale by the general public. Some people want to sell in order that they may divert the money into national war channels. Other sellers include a proportion of railway stockholders rendered apprehensive of war damage to the companies' properties. Normally, demand exists to take such stock as is offered cheaply, but when times are out of joint, the usual supporters of the market are not to be found. Some buyers there still are left, in numbers, however, insufficient to counteract the effect of the sellers' anxiety to dispose of stock. Prices move comparatively little. The disposition of the market keeps to the dull side, and there is not enough business doing in the stocks to bring about any such sharp fluctuation in prices as would compel public attention to the stocks. Southern 5 per cent. preferred is 1 lower at 74, the 5 per cent. preferred ordinary, at 42½, is 1½ down.

British Insulated Cables

As usual, the interim dividend on British Insulated Cables ordinary shares is the 5 per cent. which the shareholders have been accustomed to receive for years past. Subject to the proviso that nothing is certain in these uncertain days, it might appear tolerably safe to expect a repetition of the regular 15 per cent. final that would make 20 per cent. for the year. On the Company's ordinary share capital of three million pounds, the dividend, in each of the years 1937-1939 inclusive, absorbed £400,000. In the last published accounts, those for the year ended December 31st, 1939, the carry-forward of £488,000 was the largest in the Company's history. An idea of the strength of the British Insulated position can be seen from the fact that reserves are £1,950,000 and investments, at cost or under £1,792,000, the latter being exclusive of £571,000 investments, at cost or under, in subsidiaries. The Company had in addition £630,000 cash. Figures such as these, taken from the report published last March, justify the current price of 72s. 6d., at which the yield is a shade more than 5½ per cent. on the money.

British Aluminium

British Aluminium has announced an interim dividend on its ordinary shares of 3 per cent., being 1 per cent. less than that of a year ago. The full dividend for the last completed twelvemonth was 12½ per cent., but, as mentioned here last month, a considerable portion of the Company's bauxite properties are in France. It is from bauxite that British Aluminium derives much of its earnings. The Company's principal works are situated in Scotland, and efforts are being made to find sources of supply of bauxite outside French territory. No surprise would have been felt if the interim dividend had suffered a larger cut than 1 per cent., and the price of the shares is 1s. 6d. better at 35s. 9d. ex dividend. The present time is too early for any forecast to be made as to the results for the year, but the reduction in the interim dividend suggests a possible lowering of the final. As with other cases in which an interim dividend has been cut, the yield on the shares given in the final column of the tables overleaf is now represented by a non-committal stroke, instead of a calculation (which might turn out to be misleading), based on the dividend for the previous full year.

Dollar and Foreign Securities

On Tuesday in this week the Stock Exchange Committee ordered that prices in the Daily Official List should be brought into correspondence with actual values in the cases of securities where restriction has been applied since June 18th last on account of these issues being in foreign currency. It will be noticed that American Telephone and Telegraph stock, for example, has been raised to 200. The step was overdue. Retention of these particular stocks and shares in our list of quotations becomes justified by this amendment of a Stock Exchange regulation that has proved to operate unfairly in a good many cases.

The Ill Wind

Holders of stocks and shares in Argentine companies are inclined to quote Shakespeare's "Ill blows the wind," seeing that the remoteness of their interests from the theatre of war is the reason given for a little buying in to-day's quiet markets. Moreover, the British Government is in negotiation for a loan from Argentina, the money to be directed towards the purchase of Argentine produce required by this country in connection with its war needs. Various Argentine railway and industrial issues are being examined by the speculative investor, whose attention to them has already had a marked effect upon some of the prices. Anglo-Argentine Tramways has yet to come within the circle of this revival of interest. The Company's stocks are little better than mere gambling counters, as matters stand at present.

Miscellaneous Matters

County of London Electric Supply shares, now at 27s. 6d., have fallen a florin since last week. The shares in two other companies in the group, Bournemouth & Poole, and South London, are a trifle easier at 38s. 9d. and 20s. respectively. Lancashire Light and Power and Yorkshire Electrics show small declines. London Associated are weak at 13s. 9d. Dealers in the market attribute the dullness to lack of business more than to any noticeable selling pressure. The Electric Supply Corporation has declared, for the seventh successive year, an interim dividend of 3½ per cent. At 37s. 6d. ex dividend the shares give a return of £6 2s. 8d. on the basis of the dividend of 11½ per cent. paid last year.

British Thermostat maintains its previous interim of 7½ per cent. and the price, now ex dividend, is 8s. 9d. Assuming the final to be 11 per cent., as before, the shares will pay 10½ per cent. on the money. Manufacturing and equipment shares are virtually without change since a week ago. Cable and Wireless stocks hold their previous prices, the preference at 86, the ordinary at 50. Murex are easier at 67s. 6d. Another gain of 3d. lifted Telephone Rentals to 6s. 3d. Crompton Parkinsons are ⅛ lower at 13s. 9d.: the Company's financial year ends with this month.

"Omnibus" Tickets?

On the railway and bus routes controlled by the London Passenger Transport Board, ticket-holders have found the recent concessions, afforded and liberally interpreted, by order of the Board, to be of real value. Apart from the matter of money involved, the convenience has been found considerable of being able to use a season-ticket, for example, upon some alternative route to that which the ticket covers. Ticket-collectors on the railways, and conductors on the buses, have raised few questions as to the strict availability of tickets taken by passengers whose main idea is to get to and from their business, irrespective of route. The facilities thus afforded are worth bearing in mind when matters become more normal. The London Passenger Transport Board controls practically all the system of transport in London. Experience gained in the air-raid campaign initiated by the enemy suggests that the issue of an "omnibus ticket," covering travel on buses, tubes and trams, would meet with support from the Londoner whose activities, business and otherwise, involve a good deal of getting about from one place to another. The idea has been mooted in Stock Exchange circles, and appears to be worthy of attention from the Board. There can be no challenging the fact that London Transport should be organised on a more profitable basis than that which at present obtains to give the junior, *i.e.*, the "C" stock, a higher value than the current price of 28s.

Stock on Offer

Reference has already been made to the widening of inquiry for investment stocks and shares in companies that stand well removed from the theatre of war. Whether India can be included in the description is, perhaps, a debatable point, but investors who have a preference for tax-free dividends will be interested to hear that there are 8,000 Madras Electric Supply ordinary shares on offer at 25s. The company's dividend for 1939 was 6 per cent., less tax, comparing with 8 per cent., less tax, in each of the two preceding years. At the price mentioned the yield comes to £4 16s. per cent., tax free. Dividends are due in June and December.

Still further east, the ordinary shares of the Kalgoorlie Electric Power & Lighting Corporation, which are of the nominal value of 10s. each and on which an annual dividend of 7½ per cent. has been paid for some years, can be obtained at 12s. These return 6¼ per cent. at that price: the dividends are subject to a reduced rate of income tax which, at present, is 4s. 9d. in the £. It cannot be said that Palestine stands outside the war zone, but those who have been following the fortunes of the Jerusalem Electric & Public Service Corporation may care to know that there are 1,000 of the ordinary shares on offer at the par value of 20s. The company distributed 7 per cent. last year and the year before, the yield therefore being a level 7 per cent. on the money.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1940 High-est	1940 Low-est	Dividend Pre-vious	Dividend Last	Middle Price Sept. 17	Rise or Fall	Yield p.c.
Home Electricity Companies							£ s. d.
Bournemouth and Poole	63/6	38/9	15	15	38/9	+¼	—
British Power and Light	30/–	21/–	7	7	23/6	...	5 19 2
City of London	28/–	20/–	7½	7½	21/6	...	—
Clyde Valley	38/6	25/–	8	8	31/3	...	5 2 5
County of London	43/3	22/–	10½	10½	27/6	–2/–	7 12 10
Edmundson's:							
7% Pref.	31/6	26/3	7	7	28/3	...	4 19 1
Ord.	27/6	18/6	9	6	23/–	...	5 4 4
Elec. Dis. Yorkshire	40/3	32/6	9	9	32/6	...	5 10 9
Elec. Fin. and Securities	41/3	34/6	12½	12½	38/9	...	6 9 0
Elec. Supply Corporation	46/3	37/–	12	11½	37/6xd	+6d.	6 2 8
Isle of Thanet	16/–	5/6	4	4	6/–	...	13 6 8
Lancs Light and Power	33/–	25/–	7½	7½	25/9	–6d.	5 16 6
Llanelly Elec.	21/–	17/–	5½	5½	17/6	...	6 5 9
Lond. Assoc. Electric	21/–	12/6	7	5½	13/9	–2/–	—
London Electric	37/6	19/–	8	7	20/–	...	7 0 0
London Power Deb. Red.	105½	101	5	5	100½	...	4 19 6
Metropolitan	41/6	23/6	12	10	28/9	...	6 19 2
Midland Counties	39/–	24/3	8	8	28/9	...	5 11 5
Mid. Elec. Power	40/–	29/6	9	9	32/–	...	5 12 6
Newcastle Elec.	29/9	24/6	7	7	24/6	...	5 14 3
North Eastern Electric:							
Ordinary	31/6	17/6	7	7	22/6xd	...	6 4 5
7% Pref.	32/6	26/6	7	7	27/6xd	...	5 1 10
Northampton	48/–	39/–	10	10	38/9	...	5 3 3
Notting Hill 6% Pref. (£10)	10¾	9	6	6	9	...	—
Northmet Power:							
Ordinary	42/3	23/–	10	10	28/9	...	—
6% Pref.	29/–	23/–	6	6	26/–	...	4 12 4
Richmond Elec.	24/6	18/–	7	6	18/9	...	—
Scottish Power	38/–	24/–	8	8	28/9	...	5 11 4
Southern Areas	21/3	13/9	5	5	13/9	...	7 5 6
South London	23/3	20/–	7	7	20/–xd	–¼	7 0 0
West Devon	20/–	18/6	5	5	20/–	...	5 0 0
West Glos.	21/3	15/–	2¼	4¼	16/3	...	5 10 10
Yorkshire Elec.	40/–	24/6	8	8	28/9	–¼	5 11 4
Overseas Electricity Companies							
Atlas Elec.	4/–	1/3	Nil	Nil	1/9	...	—
Calcutta Elec.	37/–	22/6	10*	8*	28/–	...	5 14 6
Cawnpore Elec.	30/–	24/–	10	10	25/–	...	8 0 0
East African Power	25/6	20/–	7	7	20/–	...	7 0 0
Jerusalem Elec.	24/–	17/9	7	7	18/9	...	7 9 4
Kalgoorlie (10/–)	12/6	9/6	7½	7½	11/–	...	6 16 5
Madras	26/9	23/6	8*	6*	23/9	...	5 1 1
Montreal Power	35½	30	1½	1½	32	...	—
Palestine Elec. "A"	25/–	13/–	5*	Nil	13/9	...	—
Perak Hydro-electric	20/3	13/6	6	2½	13/9	...	3 12 9
Shawinigan Power	27½	19	83cts.	90cts.	20½	...	—
Tokyo Elec. 6%	69	52	6	6	52½	...	11 8 6
Victoria Falls Power	75/9	56/–	15	15	65/–	...	4 12 4
Whitehall Investments Pref.	17/9	8/–	7½	7½	9/6	...	15 16 0
Public Boards							
Central Electricity:							
1950–70	110½	104	5	5	104½	...	4 15 8
1955–75	112½	106	5	5	105½	...	4 14 9
1951–73	107½	102	4½	4½	102½	...	4 7 10
1963–93	96½	90	3½	3½	91	+1	3 17 0
London Elec. Trans Gtd.	92	87½	2½	2½	90	...	2 15 7
London & Home Counties							
1955–75	113½	105	4½	4½	105½	...	4 5 4
Lond. Passenger Transport							
A	116	104	4½	4½	107	...	4 4 0
B	116	102½	5	5	104½	...	4 15 8
C	65½	25	1½	1½	28	...	5 7 2
West Midland Joint Elec.							
1948–68	106½	105	5	5	103½	...	4 16 9
Telegraph and Telephone							
American Tel. & Tel.	215	180	9	9	200	+10	4 10 0
Anglo-Am. Tel.:							
Pref.	106	85	6	6	91	+1	6 11 10
Def.	23½	18	1½	1½	19½	...	7 13 10
Anglo-Portuguese	22/6	10/–	8	8	15/–	...	10 13 4
Cable & Wireless:							
5½% Pref.	99¾	70	4½	5½	86	...	6 8 0
Ord.	65	28½	4	4	50	...	8 0 0
Income	99¾	93	...	...	97	...	4 0 0
Canadian Marconi $1	6/–	4/–	Nil	4cts.	4/3	...	—
Globe Tel. & Tel.:							
Ord.	32/6	21/6	7½*	6*	25/–	...	4 16 0
Pref.	22/9	22/6	6	6	23/9	...	5 1 1
Great Northern Tel. (£10)	20	11	20	20	12½	...	—
Inter. Tel. & Tel.	5½	3	Nil	Nil	3½	+½	—
Marconi-Marine	30/–	18/3	10	7½	18/9	...	8 0 0
Oriental Telephone Ord.	2½	47/6	12*	11½*	2¾	...	4 16 10
Telephone Props.	15/–	11/–	5	6	12/6	...	9 12 0
Telephone Rentals (5/–)	9/6	5/9	10	10	6/3	+3d.	8 0 0
Traction and Transport							
Anglo-Arg. Trams:							
First Pref. (£5)	4/3	1/3	Nil	Nil	2/–	...	—
4% Inc.	11½	2	Nil	Nil	3½	...	—
British Electric Traction:							
Def. Ord.	830	440	5	45	600	...	7 10 0
Pref. Ord.	169	134	8	8	140	...	5 14 3
Bristol Trams	48/6	34/6	10	8*	35/–	...	—
Brazil Traction	12½	5½	$1	50c.	5½	...	—
Calcutta Trams	24/–	16/3	8	5½	17/–	...	6 9 4
Cape Elec. Trams	18/6	16/–	5	5	17/–	...	5 17 3
Lancs Transport	35/–	27/6	10	10	30/–	...	6 13 4
Mexican Light:							
1st Bonds	33	27	5	5	27½	...	—
Rio 5% Bonds	90	74	5	5	80	...	6 5 0
Southern Rly.:							
5% Prefd.	79	35	5	5	42½	–1½	11 15 4
5% Pref.	104½	60	5	5	74	...	6 15 2
T. Tilling	45/9	31/–	10	10	35/–	–1	5 14 3
Tilling & B.A.	47/6	43/9	9*	8*	45/–	...	—
West Riding	35/–	26/–	10	10	30/–	...	6 13 4
Equipment and Manufacturing							
Aron Electricity Ord.	17/6	10/–	15	Nil	14/–	...	—
Assoc. Elec.:							
Ord.	43/3	27/–	10	10	35/–	...	5 14 3
Pref.	35/3	32/3	8	8	33/9	...	4 14 10
Automatic Telephone & El.	47/3	32/–	12½	12½	37/6	...	6 13 4
Babcock & Wilcox	50/–	28/6	10	11	32/6	...	6 15 4
British Aluminium Ord.	56/–	33/–	12½	12½	35/9	+¼	—
British Insulated Ord.	92/6	67/–	20	20	72/6	...	5 10 4
British Thermostat (5/–)	14/9	6/6	18½	18½	8/9xd	...	10 11 6
British Vacuum Cleaner(5/-)	12/6	4/9	40	12½	6/3	...	10 0 0
Brush Ord.	4/6	1/9	Nil	Nil	2/6	...	—
Callender's	69/–	46/–	15	15	52/6	...	5 14 3
Chloride Elec. Storage	72/6	55/–	15	15	2½	...	5 4 4
Consolidated Signal	72/6	59/–	36½	17	60/–	...	5 13 4
Crabtree (10/–)	24/9	17/6	17½	17½	20/–	...	8 15 0
Crompton Parkinson:							
Ord. (5/–)	20/–	12/6	30	20	13/9	–¼	7 5 6
E. K. Cole (5/–)	5/–	2/6	10	Nil	3/–	...	—
Elec. & Musical Industries (10/–)	10/3	4/3	5	Nil	6/9	...	—
Electric Construction	36/3	30/–	13½	10	30/–	...	6 13 4
Enfield Cable Ord.	56/–	40/6	25	16½	45/–	...	7 4 6
Electrical Switchgear (10/–)	22/6	20/–	16	10	20/–	...	5 0 0
English Electric	33/9	16/6	10	10	25/–	...	8 0 0
Ensign Lamps (5/–)	15/3	12/6	25	25	13/9	...	9 1 10
Ericsson Tel. (5/–)	39/3	25/–	25*	25*	25/–	...	5 0 0
Ever Ready (5/–)	28/3	17/3	30	40	24/6	...	8 3 4
Falk Stadelmann	18/3	12/6	6	7	13/9	...	10 3 8
Ferranti Pref.	25/–	23/–	7	7	23/3	...	6 0 5
G.E.C.:							
Pref.	32/6	27/–	6½	6½	28/9	...	4 10 6
Ord.	83/3	56/–	20	20	69/6	...	5 15 1
Greenwood & Batley	25/6	20/–	15	13	20/–	...	13 0 0
Hall Telephone (10/–)	18/6	8/9	15	10	11/3	+¼	8 17 10
Henley's (5/–)	21/6	13/6	20	20	16/3	...	6 3 1
4½% Pref.	21/3	20/6	4½	4½	21/3	...	4 4 8
Hopkinsons	46/9	33/6	12½	15	35/–	...	8 11 6
India-Rubber Pref.	21/–	20/–	5½	5½	20/9	...	5 6 0
Intl. Combustion	121/3	70/–	32½	32½	4	...	8 2 6
J. Lucas	60/6	40/–	15	15	50/–	...	6 0 0
Johnson & Phillips	50/9	33/–	12½	15	40/–	...	7 10 0
Lancashire Dynamo	59/9	47/6	25	20	47/6	...	8 8 5
Laurence Scott (5/–)	11/–	6/–	15	15	8/–	...	9 7 6
London Elec. Wire	25/6	20/–	7½	7½	22/6	...	6 13 4
Mather & Platt	46/6	30/–	13½	10	33/9	+6d.	5 18 6
Metropolitan Elec. Cable Pf.	22/–	21/3	5½	5½	21/3	...	5 3 6
Murex	86/9	52/6	20	20	67/6	–½	5 18 4
Pye Deferred (5/–)	9/–	6/9	25	25	8/9	...	14 5 8
Revo (10/–)	20/9	12/6	17½	5	12/6	...	4 0 0
Reyrolle	60/6	41/–	12½	12½	43/9	...	5 14 2
Siemens Ord.	23/9	16/3	7½	7½	17/6	...	8 11 6
Strand Elec. (5/–)	2/3	9d.	10	4	1/3	...	16 0 0
S. Smith (1/–)	8/–	3/6	37½	50	6/3	...	8 0 0
Switchgear & Cowans (5/–)	11/9	5/6	20	10	6/3	...	8 0 0
Telegraph Condenser (10/–)	8/9	6/3	5	...	8/9	...	—
Telegraph Construction	42/6	29/–	10	10	30/0	...	6 13 4
Telephone Mfg. (5/–)	9/–	5/–	9	9	5/6	...	8 3 8
Tube Investments	96/9	61/3	23¾	23¾	80/–	–¼	5 18 9
Vactric (5/–)	3/6	2/–	4	Nil	2/3	...	—
Vickers (10/–)	22/–	9/6	10	10	13/3	...	7 11 0
Ward & Goldstone (5/–)	19/9	12/6	20	20	12/6	...	8 0 0
Westinghouse Brake	46/–	32/9	17½	10	32/6	...	6 3 1
Walsall Conduits (4/–)	26/6	17/6	55	55	23/9	...	9 5 0
West, Allen (5/–)	7/–	3/–	10	7½	3/9	...	10 0 0

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1938

33772. "Automatic regulation of synchronous electric generators." Akt. Ges. Brown, Boveri & Cie. November 20th, 1937. (525189.)

36466. "Electric valve circuits for automatic control of the speed of dynamo-electric machines." British Thomson-Houston Co., Ltd. December 14th, 1937. (524981.)

1939

696. "Gas-blast electric switches." British Thomson-Houston Co., Ltd. January 7th, 1938. (524983.)

1035. "Electric cables." Pirelli-General Cable Works, Ltd., and R. E. Horley. January 12th, 1939. (524989.)

1105. "Electron-discharge circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and O. E. Keall. January 12th, 1939. (524992.)

1290. "Striking mechanism for synchronous-motor electric clocks." L. J. Saville. January 14th, 1939. (524995.)

1499. "Electric oven for the preheating of thermosetting compositions." January 16th, 1939. (525261.)

2590. "Electrically heated tubular melting furnaces." Henley Extrusion Machine Co., Ltd. (in liquidation). P. Dunsheath and F. T. Griffiths. February 18th, 1939. (525192.)

4437. "Deflecting electrode structures for cathode-ray tubes." Marconi's Wireless Telegraph Co., Ltd. (Radio Corporation of America). February 10th, 1939 (Convention date not granted). (525000.)

4510. "Telephone systems." General Electric Co., Ltd., and J. Scowcroft. February 11th, 1939. (525004.)

4553. "Transmission of alternating currents and more particularly the modulation of carrier currents in accordance with ringing currents." C. Lorenz Akt. Ges. February 12th, 1938. (525019.)

4564. "Modulation systems for modulating ultra-short waves." Telefunken Ges. für Drahtlose Telegraphie. February 11th, 1938. (525022.)

4580. "Single-phase condenser-type induction motors." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 14th, 1938. (525026.)

4617. "Electric counting machines." February 11th, 1938 (Cognate application 4618/39). (525030.)

4672. "Time-bases for television receivers and like purposes." General Electric Co., Ltd., R. J. Clayton and G. W. Edwards. February 13th, 1939. (525049.)

4683. "Sound-recording." Radio Corporation of America. February 12th, 1938. (525052.)

4685. "Electric welding machines." British Thomson-Houston Co., Ltd. February 12th, 1938. (525053.)

4686. "Anodes for electron-discharge devices." British Thomson-Houston Co., Ltd. February 12th, 1938. (525054.)

4687. "Fluid-blast electric circuit-breakers." British Thomson-Houston Co., Ltd. February 12th, 1938. (525055.)

4688. "Electric motor control systems." British Thomson-Houston Co., Ltd. February 12th, 1938. (525056.)

4735. "Electric high-speed locomotives for great tractive efforts." Schweizerische Lokomotiv-und Maschinenfabrik. February 15th, 1938. (525066.)

4789. "Electric soldering irons." J. H. White. February 14th, 1939. (525078.)

4820. "Remote-control installation operating according to the impulse method with a protective device against incorrect switching due to foreign or disturbing impulses." July 21st, 1938. (525123.)

4834. "Negative feedback amplifiers." Standard Telephones & Cables, Ltd. April 15th, 1938. (525126.)

4835. "Radio transmitters." Standard Telephones & Cables, Ltd. April 13th, 1938. (525127.)

4836. "Radio-receiving and like apparatus." Felgate Radio, Ltd., and A. S. Williams. February 14th, 1939. (525128.)

4849. "Electric motors." British Thomson-Houston Co., Ltd. February 14th, 1938. (525130.)

4850. "Arrangements for extinguishing electric arcs." British Thomson-Houston Co., Ltd. (Allgemeine Electricitäts Ges.). February 14th, 1939. (525131.)

4855. "Circuit arrangements for operating electric discharge devices." General Electric Co., Ltd., N. L. Harris and R. H. Kirkness. February 14th, 1939. (525133.)

4857. "Luminescent materials." General Electric Co., Ltd. (Patent Treuhand Ges. für Elektrische Gluhlampen). February 14th, 1939. (525134.)

4887. "Spark-quenching arrangements for use in telephone or like systems." Automatic Telephone & Electric Co., Ltd., and S. A. Wickerson. February 14th, 1939. (525137.)

4888. "Methods for the electro-mechanical recording of sound vibrations." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 17th, 1938. (525138.)

4893. "Brush holders for electric machines." L. Schunk and H. Ebe (trading as Schunk & Ebe). February 14th, 1938. (525140.)

4940. "Electron-discharge devices." H. E. Kallmann. February 15th, 1939. (525145.)

4993. "Control systems for electrical range units and the like." Proctor & Schwartz, Inc. February 21st, 1938. (525089.)

4998. "Dynamic sound-converting apparatus." British Thomson-Houston Co., Ltd. February 16th, 1938. (525154.)

5012. "Electric indicating or repeating instruments." Smith & Sons (Motor Accessories), Ltd., and E. B. Moss. February 15th, 1939. (525092.)

5024. "Short-wave radio antenna systems." Marconi's Wireless Telegraph, Co., Ltd. (P. S. Carter). February 15th, 1939 (Convention date not granted). (525159.)

5052. "Self-regulating automatic traffic-control systems." Forest City Electric Co., Ltd. (Nachod & United States Signal Co., Inc.). February 16th, 1939. (525270.)

5061. "Modulators and demodulators." Siemens Bros. & Co., Ltd., and M. Reed. February 16th, 1939. (525166.)

5086. "Portable electric lamps." J. Lucas, Ltd., and H. V. Simco. February 16th, 1939. (525097.)

5113. "Electrical sockets and contact members therefor." Cinch Manufacturing Corporation. March 5th, 1938. (525208.)

5138. "Electric circuit-breakers having arc-extinguishing arrangements." General Electric Co., Ltd., and C. J. O. Garrard. February 16th, 1939. (525217.)

5140. "Cathode-ray tubes." C. Lorenz Akt.-Ges. February 16th, 1938. (525218.)

5154. "Regulating systems." British Thomson-Houston Co., Ltd. February 16th, 1938. (525220.)

5155. "Electric light fittings, lanterns, or the like." British Thomson-Houston Co., Ltd., E. B. Tuppen and L. Hubble. February 16th, 1939. (525221.)

5214. "Automatic control of television receiving systems." Hazeltine Corporation. March 15th, 1938. (525284.)

5238. "Lighting units." Revo Electric Co., Ltd., and F. H. Reeves. February 17th, 1939. (525225.)

5243. "Mounting of electric fuses, cut-outs, connectors, links, and the like." February 17th, 1939. (525289.)

5303. "Caps and sockets for liquid-cooled lamps." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Gluhlampen). February 17th, 1939. (525305.)

5322. "Visual indicators for use in wireless direction-finding and like systems." Standard Telephones & Cables, Ltd., F. N. Scaife and C. W. Earp. February 17th, 1939. (525180.)

5323. "Cathode-ray tubes." Kolster-Brandes, Ltd., and C. N. Smyth. February 17th, 1939. (525181.)

5325. "Electric wave transmission systems involving range compression or expansion." Kolster-Brandes, Ltd., and W. A. Beatty. February 17th, 1939. (525183.)

5330. "Rectifier." A. H. Blue and R. D. Wood. February 17th, 1939. (525311.)

5420. "Indicator apparatus for power plants comprising an internal combustion engine coupled to an electric generator." Sulzer Freres Soc. Anon. May 5th, 1938. (525187.)

5623. "Thermally operated electric switches." J. E. Sherlock and British Thermostat Co., Ltd. February 20th, 1939. (525106.)

5755. "Insulation of electrical conductors or apparatus." A. Reyrolle & Co., Ltd., and P. D. Ritchie. February 2nd, 1939. (525244.)

5903. "Battery-charging equipment." R. S. Hinds, A. Mandl and Metropolitan-Vickers Electrical Co., Ltd. February 22nd, 1939. (525248.)

7777. "Variable electrical resistances." A. S. H. Brackenbury and Kodak, Ltd. March 10th, 1939. (525111.)

Contract Information (*Concluded from page 254*)

Contracts in Prospect—contd.

holme, for Regional Education Committee; secretary, 1, Wellington Place, Belfast.

CARRICKFERGUS.—Shelters (11), for U.D.C.; surveyor, Town Hall, Carrickfergus, Northern Ireland.

Northumberland.—Air-raid shelters for County Council; J. Urpeth, contractor, Gibsons Buildings, Front Street, Bedlington, Northumberland, and Pierce, builders, Dunbar, Scotland.

Northwich.—Public shelters for R.D.C.; J. Birtwistle, engineer and surveyor, Rural District Council Offices, Northwich. Canteen and rest room adjoining the fire station; surveyor, Council Offices.

Peterborough.—Shelters to accommodate 1,954 people are to be provided at estimated cost of £4,080.

Poole.—Shelters, etc., at various schools (£8,679); borough engineer, Municipal Offices, Park Gates East.

Portsmouth.—Shops, 143-7, Commercial Road; Littlewood's Stores, Ltd.

Prestwick.—Public shelters (12); burgh surveyor.

Sheffield.—Engineering workshop and foundry block, College of Technology; city engineer.

Stafford.—Domestic communal shelters; W. Plant, borough surveyor, Town Hall.

Stretford.—Communal shelters for 1,500 persons; E. Parker, borough engineer, Town Hall.

Sunderland.—Public shelters; C. Emmerson, architect, Rural District Council Offices, The Esplanade, Sunderland.

Thorne.—Shelters for R.D.C.; H. Plews, surveyor, Town Hall, Thorne, near Doncaster.

Uttoxeter.—Communal domestic shelters for U.D.C.; S. S. Proud, surveyor, Council Offices.

Walton and Weybridge.—Public shelters for U.D.C.; surveyor, Council Offices, Hersham Road, Walton-on-Thames.

Wayland.—Nine domestic communal shelters in parish of Watton, for R.D.C.; C. Whitworth, surveyor, Council Offices, Attleborough.

Wellingborough.—Air-raid shelters (50 persons each) for U.D.C.; surveyor.

Wigan.—Communal shelters; B. H. Lyon, borough engineer, Municipal Buildings.

Wigston.—Shelters on 11 sites, for U.D.C.; surveyor, Council Offices, Wigston, Leics.

Woking.—Surface type domestic shelters in various parts, for U.D.C.; G. F. Hawkins, engineer, Council Offices, Woking.

Worsley.—Communal domestic shelters for U.D.C.; L. T. Broom, surveyor, Council Offices, Walkden, near Manchester.

Yorkshire.—Scheme approved for air-raid shelters at six schools (£5,680); J. W. White, county architect, County Hall, Northallerton.

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.

Australia. — SYDNEY. — October 24th. County Council. One 50,000-kW steam turbo-alternator set for the Bunnerong power station. (T. 16057/40.)*

MELBOURNE.—State Electricity Commission. October 15th. 4,000 ft. of cable for use on a three-phase 6.6-kV system. (T. 21227/40.)*

Birkenhead.—September 30th. Mersey Railway Co. Stores, including electrical sundries, bakelite lamp holders, &c. Particulars from R. Varley, general manager and engineer, Central Station. Samples may be viewed on September 23rd and 24th.

Birmingham.—September 27th. Electric Supply Committee. Storage batteries and charging equipment. (September 6th.)

Edinburgh.—September 27th. Electricity Department. Installation of electric lighting in farm buildings at Bangour Farm, West Lothian. Specifications (£1 1s.) from the Engineer's Office, Dewar Place, Edinburgh.

New Zealand.—WELLINGTON.—October 8th. Public Works Department. 20,000-kVA synchronous condenser with control and protective equipment. (T. 21199/40.)* Four 2,500-kVA transformers or alternatively eight 1,677-kVA transformers. (T. 21197/40.)*

October 15th. 66-kV outdoor switchgear and steelwork for Winton substation. (T. 21206/40.)*

Public Works Department. October 22nd. Transformers and relays.

October 29th. Two motor-driven pumps and equipment. (T. 21604/40.)*

November 5th. 110-kV gang-operated outdoor type switchgear. (T. 21700/40.)*

Salford.—September 30th. Corporation. Three-phase oil-immersed power transformers. (See this issue.)

South Africa.—PRETORIA.—Union Tender and Supplies Board. October 3rd. Distribution boards, switches and fuses, and switch boxes. (T.21239/40.)*

October 24th. Three batteries (twenty-six 600 Ah cells each). (T. 21552/40.)* Miscellaneous electrical requisites. (T. 21549/40.)*

October 10th. Public Works Department. Laundry machinery, including electric motors, for Krugersdorp Mental Hospital. (T. 21352/40.)*

One 15-kW Diesel engine lighting plant for the Agricultural College, Glen, O.F.S. (T. 21351/40.)*

CAPE TOWN.—October 8th. Electricity Supply Commission. Two 2,000-kVA transformers. (T. 21222/40.)*

November 12th. Two 300-kVA, three-phase transformers. (T. 21801/40.)*

PORT ELIZABETH.—October 24th. City Electrical Engineer's Department. Transformers, low-voltage units, &c. (T.Y. 21558/40.)*

JOHANNESBURG. — October 19th. City Council. Electric lamps. (T. 21542/40.)*

October 24th. Public Works Department. L.v. underground cable. (T.Y. 21433/40.)*

October 14th. Four switchboards and two 400-kVA transformers. (T. 21795/40.)*

Stoke-on-Trent.—October 9th. Electricity Department. Replating battery. (See this issue.)

Orders Placed

Bradford.—Electricity Committee. Accepted. De-aerator (estimated £3,000).—Hick, Hargreaves & Co.

Belfast.—Electricity Committee. Accepted. Three-phase, low-voltage, high-rupturing capacity switchgear (£8,513).—A. Reyrolle & Co. The prices varied between £7,877 and £11,590, but those below the accepted tender were rejected as not conforming to specification or because their design was not approved.

Eire. — DUBLIN. — Corporation. Accepted. 750 street-lighting lanterns (£1 8s. each).—G.E.C.

Glasgow.—Art Galleries Committee. Accepted. Overhauling of heating batteries in Kelvingrove Art Galleries (£284).—H. M. Anderson.

Police Committee. Accepted. Seven RP38 receivers (£164).—Marconi's Wireless Telegraph Co.

Transport Committee. Accepted. Lamps for conductors (experiment).—Thomas Scott & Co.

Portsmouth.—Contracts Committee. Accepted. Sound amplifying equipment for the police (£52).—Tannoy, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington.—Houses, Milnshaw Estate; borough engineer.

Additions, Broad Oak Printworks; Calico Printers Association, Ltd.

Adwick-le-Street.—Communal shelters (66), for U.D.C.; surveyor, Council Offices.

Alfreton.—Shelters for U.D.C.; surveyor, Council Offices, Cornhill House.

Bangor (N. WALES).—Dairy and plant; Anglesey and Carnarvonshire Farmers' Dairies, Limited, Snowden Buildings, Bangor.

Bath.—School shelters (£5,000), for E.C.; education architect, Education Office, Sawclose, Bath.

Brierley Hill.—Domestic surface shelters (300); R. H. J. Comber, engineer, Hawbush House, Brierley Hill.

Bootle.—Alterations to Masonic Hall, Balliol Street.

Burnley.—Fire station and houses; E. L. Beckett, borough engineer, Town Hall.

Carlisle.—Hostel; L.M.S. Railway.

Cheltenham.—Shelters; G. Gould Marsland, borough engineer, Municipal Offices.

Chippenham.—Shelters (£5,750), for Town Council; borough engineer.

Chorlton-on-Medlock. — Additions to Convent, Rumford Street and Dover Street; W. Ellis, architect, Union Bank Chas., Hardshaw Street, St. Helens.

Clitheroe.—Shelters at elementary schools; F. Margerison, borough engineer, Church Street, Clitheroe.

Corby. — Shelters for U.D.C.; N. Bridger-Sage, clerk, Council Offices, The Jamb, Corby, Northants.

Coventry.—Extensions to fire station; D. E. E. Gibson, city architect, 1a, Warwick Row.

Crumpsall.—Houses, Slack Road, for J. Saxon, builder, 508, Victoria Avenue; Roberts, Wood and Elder, architects, 26, King Street, Manchester.

Dalkeith.—Extensions to buildings; S.M.T. Co., Ltd.

Dewsbury.—Public shelters for 8,036 persons; M. H. Forward, borough architect, Municipal Buildings.

Doncaster.—Air-raid shelters for Rural District Council (£25,000); surveyor.

Additional storey at fire station, for Watch Committee; borough surveyor, Mansion House.

Dumbartonshire.—Public shelters at Helensburgh; county clerk, 18, Park Circus, Glasgow, C.3.

Durham.—Conversion of premises at Felling-on-Tyne into first-aid post for County Council; T. A. Brown and Son, builders, Felling.

Air-raid shelter at schools at Hart and Redmarshall; F. Willey, 34, Old Elvet, Durham City.

Eire.—WEXFORD.—Pumping station for Town Council; Delap and Waller, engineers, 16, Molesworth Street, Dublin.

DUBLIN.—Construction and equipment of cold room at St. Kevins Hospital; N. Mathews, engineer, 104, Grafton Street, Dublin.

LOUTH.—Water supply works, including pumping station, Ardee, for Board of Health; P. H. McCarthy and Son, engineers, 26, Lower Leeson Street, Dublin.

Erpingham.—Shelters (10), for R.D.C.; surveyor, Council Offices, St. Peters Road, Sheringham.

Felling-on-Tyne.—Central kitchen for the Education Committee; surveyor.

Fitters' shop; U.D.C. surveyor.

Fifeshire.—School and public shelters to cost £3,850; County Council architect, Kirkcaldy.

Friern Barnet.—Shelters at Marlborough House flats, for U.D.C.; surveyor, Council Offices, N.11.

Gateshead.—Canteen for Crawhall and Sons.

Alterations to the Prince of Wales Hotel for R. Deuchar, Ltd.; Page, Son and Bradbury, architects, 75, King Street, South Shields.

Warehouse at the premises of Pembertons, Ltd.; J. Crankshaw, 11, Mirk Street, Gateshead.

Glasgow.—Shelters at Shieldhall Hospital for the Corporation; T. Lomas, architect, Office of Public Works, City Chambers, Glasgow.

Shelters; J. Reid, architect, 79, West Regent Street, Glasgow.

Hazel Grove and Bramhall. — Communal domestic shelters on various sites for U.D.C.; J. F. Andrews, surveyor, Council Offices, Hazel Grove.

Hebburn-on-Tyne.—Shelter for hospital staff; W. Dibble, U.D.C. acting surveyor.

Helensburgh.—Public air-raid shelters; borough surveyor.

Hinckley.—Office and store shed; Midland Packing Case Co., Ltd.

Jarrow-on-Tyne.—Five more public and a number of domestic shelters; J. S. Weir, borough engineer, Town Hall, Jarrow.

Leeds.—First section of new church, Seacroft Estate; Building Committee (chairman, Ven. H. Lovell Clark).

Macclesfield.—Communal domestic 48-person shelters (267); M. A. Tetlow, borough architect, Pear Tree House, Jordangate, Macclesfield.

Manchester.—Pit-head baths at Wheatsheaf Colliery; Architects' Dept., Miners' Welfare Committee, Romney House, Tufton Street, S.W.1.

Foundry and mechanic's shop; G. Garner & Sons, Ltd.

Addition to works and new smithy; Cooke & Ferguson, Ltd.

Canteen; R. Johnson & Nephew, Ltd.

Reconstruction of warehouse; T. Wainwright & Son, architects, 11, Lord Street, Liverpool.

Matlock.—Alterations and additions to Sydnope Hall, Darley Dale; trustees.

Middlesbrough.—Further school shelters for the Education Committee; P. Mellor, education architect.

Montrose. — Decontamination centre; W. M. Patrick, architect, Royal Infirmary.

Newcastle-on-Tyne.—Basement shelter at premises of Turner, Ltd.; J. Walton Taylor and Son, architects, Union Buildings, St. John Street, Newcastle.

Air-raid shelter for Northern Coachbuilders, Ltd.; S. J. Stephenson and Gillis, architects, 2, Sackville Place, Newcastle.

Northenden.—Works additions for T. French & Sons; H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester.

Northern Ireland.—LARNE. — Building for British Aluminium Co., Ltd.; J. M'Geagh, architect, 23, Ocean Buildings, Donegall Square, Belfast.

DOWN.—Temporary school at Bally-

(*Continued on page* 253.)